

# MERCHANT

## MODEL-D SERVICE INSTRUCTION BOOK

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Litho in U. S. A.

PB 403-475

**FORWARD BY OFFICE MACHINE AMERICANA**

**THIS SERIES OF MANUALS COVERS BOTH 'SILENT SPEED' MARCHANTS. BELOW 200,000 SERIAL NUMBER AND MACHINES ABOVE 200,000.**

**ON PAGES 424 IS AN ILLUSTRATION OF THE SETTING (CAM) LINE FOR MARCHANTS UNDER 200,000. ON THESE OLDER MACHINES THE SETTING (CAM) LINE TURNS 180 DEGREES WITH EACH CYCLE, SUCH AS AN ADDITION CYCLE.**

**ON PAGE 840 IS AN ILLUSTRATION OF THE SETTING (CAM) LINE ON MARCHANTS OVER 200,000. THIS SETTING (CAM) LINE TURNS 360 DEGREES WITH EACH CYCLE.**

**THIS CHANGE MADE FOR A SMOOTHER OPERATION. THIS BASIC LINE WAS USE DURING THE REMAINDER OF MARCHANT PRODUCTION.**



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# MARCHANT

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## I N D E X

	Page
17000 SECTION (SELECTION UNIT) - - - - -	404
22000 SECTION (See AUTOMATIC DIVISION) - - - - -	455
27000 SECTION (SETTING MECHANISM) - - - - -	424
32000 SECTION (ACTUATOR UNIT) - - - - -	407
37000 SECTION (CONTROL UNIT) - - - - -	435
52000 SECTION (DRIVE UNIT) - - - - -	430
57000 SECTION (POWER CLEARANCE) - - - - -	421
62000 SECTION (RESTORE MECHANISM) - - - - -	445
67000 SECTION (COUNTER MECHANISM) - - - - -	449
72000 SECTION (CARRIAGE SHIFT) - - - - -	452
82000 SECTION (MOTOR UNIT) - - - - -	427
87000 SECTION (KEYBOARD) - - - - -	403
92000 SECTION (CARRIAGE) - - - - -	414
AUTOMATIC DIVISION - - - - -	455
INTERLOCKS - - - - -	473

# MARCHANT

## KEYBOARD

1. The keyboard serves as a means of introducing amounts into the machine where they may be added, subtracted, multiplied, or divided as determined by the use of certain keys of the CONTROL SECTION (37000), page 435.

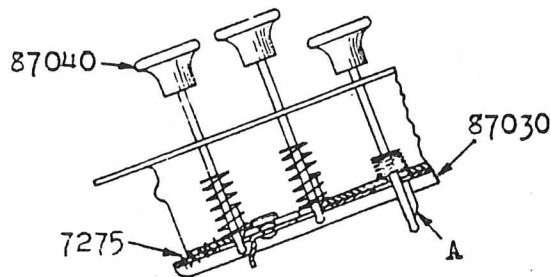


FIG. 400

2. When any numerical key is depressed, beveled lug (A) on the key stem cams Lock Bar 87030 rearward against the action of Spring 7275 thus releasing any other depressed key in that column. When the key is completely depressed Spring 7275 snaps Lock Bar 87030 forward over lug (A) thus locking down the depressed key. Fig. 400.

3. A Zero Key 87040 similarly releases a depressed key of the same column by camming Lock Bar 87030 to the rear, but the lock bar is so shaped that this key cannot latch down. Fig. 400.

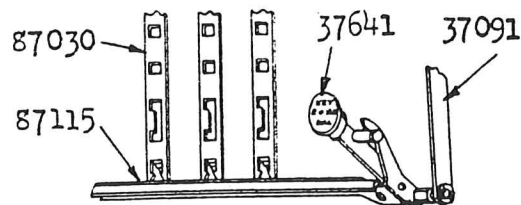


FIG. 401

4. All keys depressed on the keyboard may be released by depression of Key 37641, labeled "Keyboard Dial." The depression of this key rocks Gate 87115 which moves all Lock Bars 87030 to the rear, thus releasing all depressed keys. During multiplication and division it is necessary to retain amounts in the keyboard, therefore the numerical keys remain depressed until the Keyboard Dial Key 37641 is used or some other key is depressed in the same column. However, during addition and subtraction Gate 87115 is automatically actuated by Bar 37091 which causes all Lock Bars 87030 to be rocked rearward to release all depressed keys. Fig. 401.

5. Slots (B) on Bar 87020, into which the key stems locate, are so spaced that each successively higher numbered key locates Bar 87020 about  $1/32$  inch farther toward the rear than the key directly below it. Fig. 402.

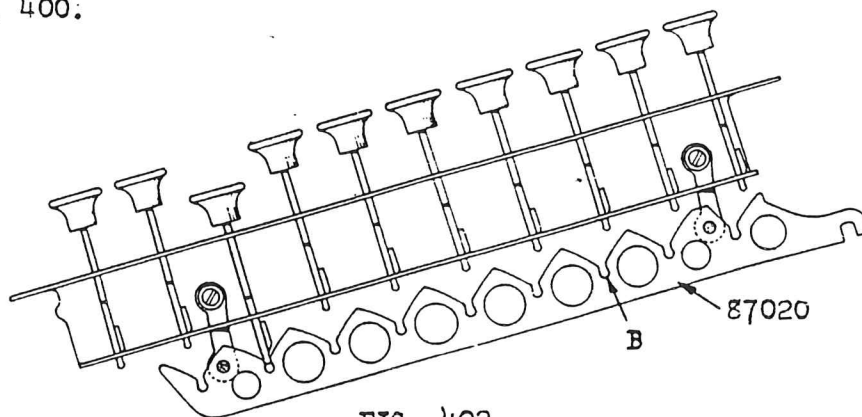


FIG. 402

# MARCHANT

## SELECTION UNIT

1. The Selection Unit, immediately to the rear of the keyboard consists of a series of dials, segments, feeler fingers and geared cams which set up and transmit amounts from the keyboard to the Actuator Unit 32000. In this assembly will also be found the Division Sensing Levers 22065, etc., a description of which will be found under the subject of Automatic Division.

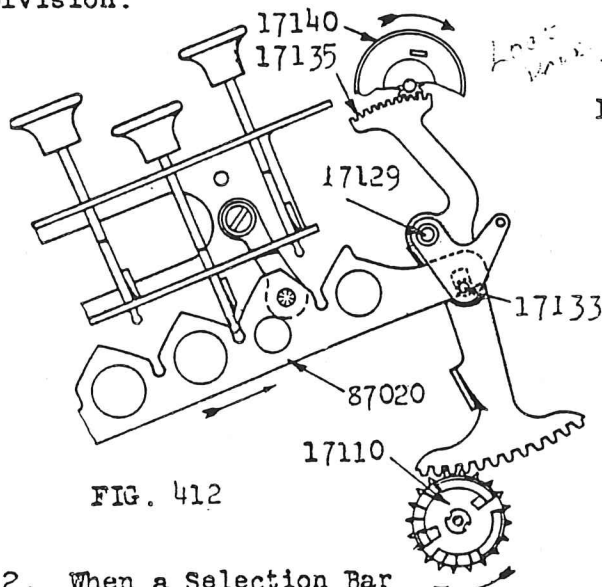


FIG. 412

2. When a Selection Bar 87020 moves to the rear upon depression of a numerical key, the rear end of the bar, which hooks over Stud 17133 on corresponding Segment 17135, rocks this segment about Shaft 17129. The segment is geared at its upper end to a Dial 17140 which is thereby caused to rotate so as to display the value of the numerical key depressed. The lower end of Segment 17135 meshes with a Cam Assembly 17110 rotating this assembly to a position determined by the depressed key. Up to this point all functions have been performed solely by a key depression and may be considered as a setting-up to prepare the machine for a definite function. Fig. 412.

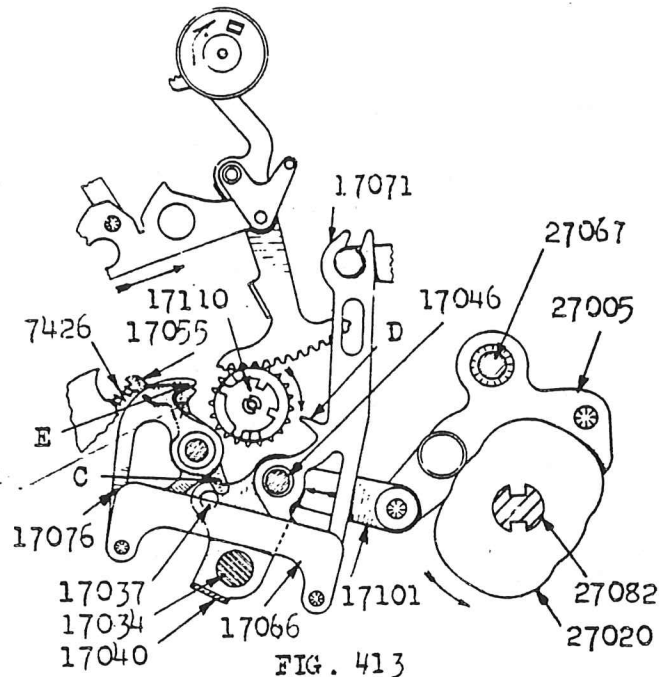


FIG. 413

3. Movable Shaft 17046 is supported by Link 17040 rockable about fixed Shaft 17034. Its rocked position is determined by Cam 27020 acting through Link 17101 attached to Cam Follower 27005 rockable about Shaft 27067. When any control key or bar is depressed Shaft 27082 is rotated through one-half turn. (See 27000 SECTION, SETTING MECHANISM, paragraph 2, page 424). This rotation causes Cam 27020 to rock Link 17040 and Shaft 17046 toward the front of the machine. The first effect of this is to move Stud 17037 on Link 17040 away from the tail (C) of Pawl 17055 thus permitting the pawl to be pushed by Spring 7426 into engagement with the gear on Cam Assembly 17110 thus accurately aligning and holding the cam in position of the keyboard selection. Fig. 413.

4. This same movement results in bringing tip (D) of Feeler Arm 17071 into engagement with its corresponding cam of Assembly 17110. When further forward movement of tip



# MARCHANT

## SELECTION UNIT . Cont'd

(D) is thus blocked, the balance of the forward movement of Shaft 17046 rocks forward the lower end of Feeler Arm 17071 thus moving forward Link 17066 and rocking Feeler Finger 17076 into engagement with the forward side of the same cam. Shaft 17046 moves just far enough forward so as to leave tips (D) and (E) of the feeler fingers separated by just the diameter of Cam 17110. Each cam is so arranged that if one of the tips hits a depression in the cam the opposite tip will hit a high point and vice versa, so that the distance between opposite tips will always be the same when Shaft 17046 has completed its forward movement, but the actual angle at which Feeler Arm 17071 stands will be determined by whether tip (D) has hit a depression, a high point, or the medium height of Cam 17110. Fig. 413.

5. Each feeler assembly in the Selection Unit controls the shifting of one Selection Lever 32164 in the Actuator Unit. Fig. 414 Each such selection lever has mounted on it a train of gears which can be shifted so as to bring either of two selections into operation. Therefore only five Feeler Assemblies (17065 and 17080) are required for each column in order to select all digits from "0" to "9" inclusive. Each feeler may be located in any of three positions; a forward position in which one of the two selections controlled becomes active, a rear position which brings the other selection into action, or a middle position in which both are neutral. The cams on Assembly 17110 are so arranged that at each selection one feeler assembly in each column will be brought into its forward or rear

position and the other four feeler assemblies in that column brought to their middle neutral position.

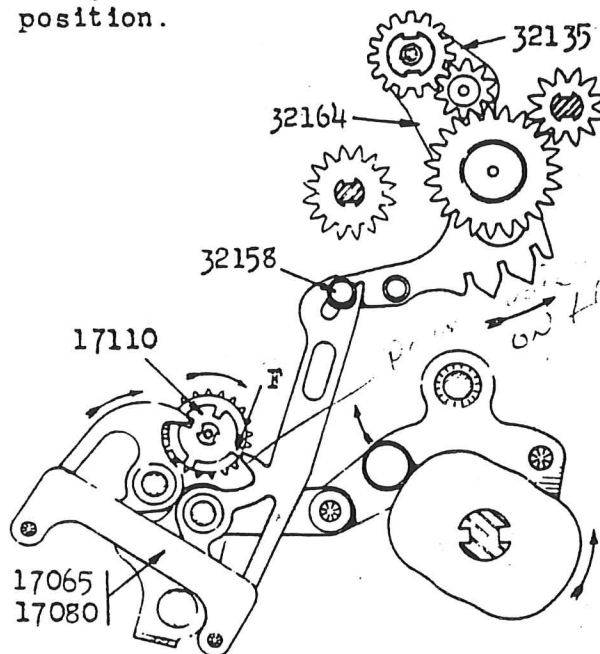


FIG. 414

### EXAMPLE:

6. A keyboard registration of "3" in any column will cause the rear feeler of the 3rd feeler assembly in that column to limit on a high point (F) on the rear of Cam 17110, forcing the opposite feeler into a notch on the front side. Both feelers of the other four feeler assemblies in that column will limit on the normal middle height of their cams. Fig. 414.

7. Similarly a "1", "2", "4", or "5" selection will cause the rear feeler of one of the other feeler assemblies to limit on a high point (F) on the rear of its cam, the opposite front feeler to locate in a notch, and all the other feelers on the normal middle height of their cams. Fig. 414.

# MARCHANT

## SELECTION UNIT . Conr'd

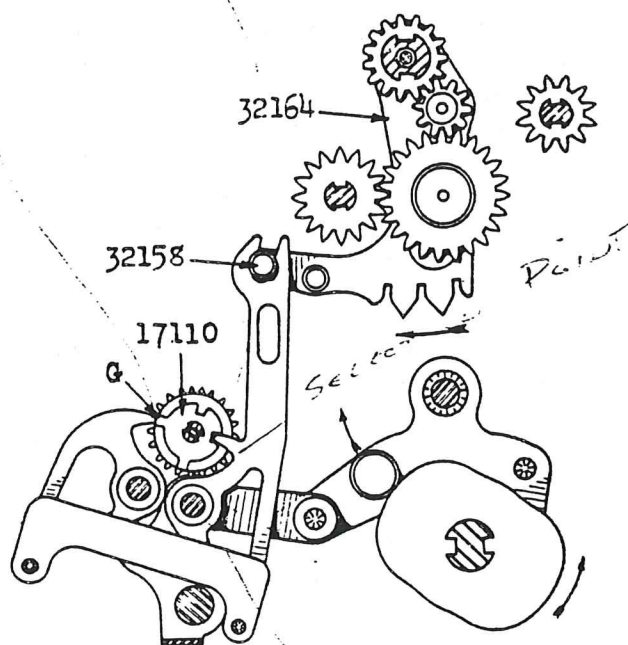


FIG. 415

8. A keyboard registration of "8" in any column will cause the forward feeler of the 3rd feeler assembly in that column to limit on a high point (G) on the front of the Cam 17110 thus forcing the opposite feeler into a notch on the rear side. Both feelers of the other four feeler assemblies in that column will limit on the normal middle height of their cams. Fig. 415.

9. Similarly a "6", "7", "9" or "0" selection will cause the front feeler of one of the other feeler assemblies to limit on a high point (G) on the front of its cam; the opposite rear feeler to locate in a notch and all the other feelers on the normal middle height of their cams. Fig. 415.

10. As these feelers move into position against the Cams 17110, the upper forked ends of the rear arms, being located over Studs 32158 of Selection Levers 32164 of Assembly 32135, rock them so as to bring certain gears of the Actuator Unit into mesh. This action connects up the gear trains of the Actuator Unit in accordance with the set up of the Selection Unit. Fig. 414 and Fig. 415.



# MARCHANT

## ACTUATOR UNIT

1. The Actuator Unit contains a series of gears assembled in groups, the meshing of which is controlled by the amount set up in the Selection Unit. When the machine is operated by the depression of a control key or bar these gears cause Pivot Gears 32142 to rotate on Shaft 32131A. The upper edge of Gear 32142 is rotated forward for positive calculations and rearward for negative calculations.

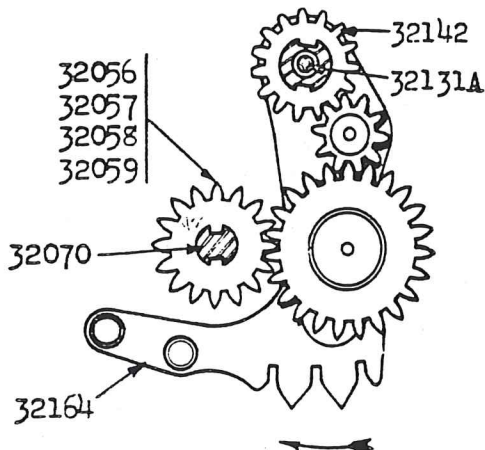


FIG. 425

2. When an operative key or bar of the Control Unit is depressed the drive mechanism turns Shaft Assembly 32070 one-half revolution per cycle. The upper side of Assembly 32070 is rotated rearward for positive operations and forward for negative operations. Keyed to this shaft (in line with each key section) is a group of four gears, No. 6 Gear 32056 (12 tooth), No. 7 Gear 32057 (14 tooth), No. 8 Gear 32058 (16 tooth), and No. 9 Gear 32059 (18 tooth). Therefore one cycle of the machine (turning Shaft 32070 one-half a revolution) will advance the No. 6 gear one-half turn or 6 teeth. Similarly

the No. 7 gear would turn 7 of its 14 teeth, and the No. 8 and No. 9 gears would turn 8 and 9 of their teeth respectively. If a Selection Lever 32164 of Assembly 32135 is set, (as the result of the depression of a numerical key, for example No. 8, see paragraph 8, page 406) so as to mesh the gear on the selection lever with its corresponding Gear 32058 on Shaft Assembly 32070 and the machine then operated, the corresponding Pivot Gear 32142 will then advance the same number of teeth as Gear 32058 and will transmit that amount to the Product Carriage Dial in that column. Fig. 425 and Fig. 426.

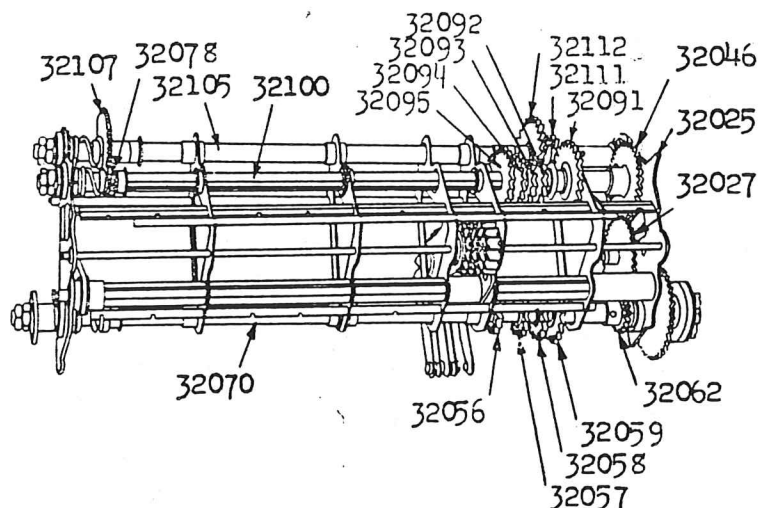


FIG. 426

3. The Quarter Turn Shaft 32100 is geared to the One-Half Turn Shaft 32070 so as to rotate one-quarter turn per machine cycle. This is accomplished by Gear 32062 pinned to Shaft 32070 driving, through Idler Gear 32027 mounted on stud on Actuator Right Frame 32025, to Gear 32046 which is pinned to Shaft 32100. Fig. 426.

# MARCHANT

## ACTUATOR UNIT . Cont'd

4. On Shaft 32100, in each order from left to right, are the No. 5 Gear 32095 (20 tooth), the No. 4 Gear 32094 (16 tooth), and the No. 3 Gear 32093 (12 tooth). Therefore, one cycle of the machine, which turns Shaft 32100 one-quarter of a revolution, will advance the No. 5 gear one-quarter of 20, or five teeth, and similarly the No. 4 and No. 3 gears four and three teeth respectively. Fig. 426.

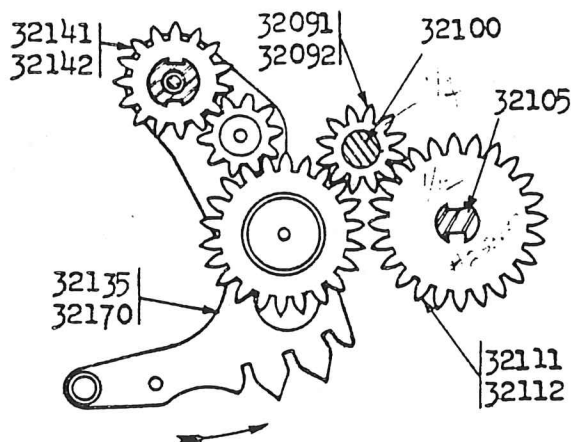


FIG. 427

5. Gear 32078, keyed to Shaft 32100, drives Gear 32107 which is keyed to Shaft 32105. These gears drive the Twelfth Turn Shaft 32105,  $1/12$  of a revolution per machine cycle. (See Fig. 426). On this shaft in each order from left to right are two gears, the No. 2 Gear 32112 (24 tooth) and the No. 1 Gear 32111 (12 tooth). One cycle of the machine, turning each of these gears  $1/12$  of a revolution, will advance the No. 2 gear two teeth and the No. 1 gear one tooth. Opposite the No. 2 Gear 32112 and the No. 1 Gear 32111, on the One-Quarter Turn Shaft Assembly 32100, are Idler Gears 32092 and 32091, not keyed to the shaft but meshing with the No. 2 and No. 1 gears. Therefore these

idler gears will also advance two teeth and one tooth respectively per machine cycle. Fig. 427.

6. Accordingly, in each order there is a group of five gears on the one-quarter turn shaft which (from left to right) will advance five, four, three, two, and one teeth for each cycle of the machine. On the one-half turn shaft there are four gears to each group which (from left to right) will advance six, seven, eight, and nine teeth respectively for each cycle of the machine.

7. In order that the movement of any of these gears may be transmitted to the carriage a series of five gear trains (32135 and 32170) are provided in each order being mounted on the selection levers. For constructional convenience four of these selection levers (which provide for selections of from "2" to "9" inclusive) are included in Assembly 32135, mounted on a single hub and forming a unit. Three of the Pivot Gears 32141 are narrow, each meshing with one of the gear trains while the fourth Pivot Gear 32142 is wide and meshes with the two remaining gear trains and with the carriage Gear 92291 when the carriage dips in operation. The fifth Selection Lever 32170 (for "0" and "1" selections) is a separate unit and carries one of the gear trains which meshes with Pivot Gear 32142.



# MARCHANT

## ACTUATOR UNIT . Cont'd

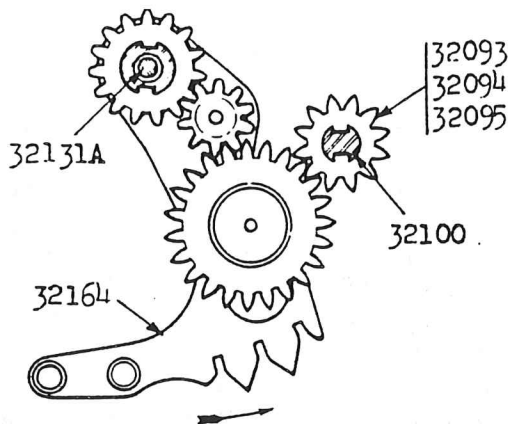


FIG. 428

8. When a Feeler Finger 17071 rocks a Selection Lever 32164 forward about Pivot Shaft 32131A the gear train on that selection lever meshes with one of the gears of the One-Half Turn Shaft 32070. (See Fig. 425); when the selection lever is rocked to the rear the gear train on that selection lever meshes with one of the gears of the Quarter Turn Shaft 32100. (See Fig. 428); and when the feeler finger positions the selection levers to a neutral position the gears on it do not mesh with the gears on either the half or the quarter turn shafts and so become inactive. Fig. 428.

9. Upon depression of an operative control key or bar, Cams 27035 keyed to Setting Shaft 27082, rock Cam Followers 27025 and 27030 about Shaft 27067 causing Links 27047 and 27055 to rock the Selection Lock Gate 27046 down about Shaft 12130 and out from engagement with notches (H) of Selection Levers 32164. This withdrawal of Selection Lock Gate 27046 occurs at the start of each setting clutch cycle, being timed to occur slightly before the Feeler Fingers 17071 position Selection Levers 32164 thus freeing them to be so positioned. As the

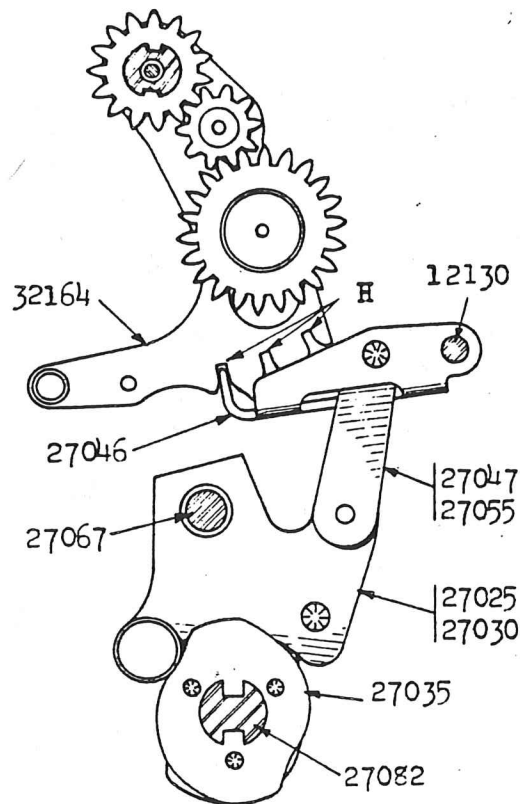


FIG. 429

Setting Shaft 27082 continues to rotate, the Feeler Fingers 17071 are rocked into a forward, neutral, or rearward position depending upon which of the numerical keys have been depressed, (see paragraph 4, page 404) thus permitting the gears on the selection levers to either mesh with the gears on the one-half turn shaft or one-quarter turn shaft or to be held in a neutral position. Thereafter Gate 27046 is forced to rise into one of the three notches (H) in Selection Levers 32164, of Assemblies 32135 and 32170, thus locking the selection selected by the feeler fingers, and accurately positioning the gears prior to the start of the main actuator drive. This holds the selection locked in the Actuator Unit until the beginning of the next machine operation. Fig. 429.

# MARCHANT

## ACTUATOR UNIT . Cont'd

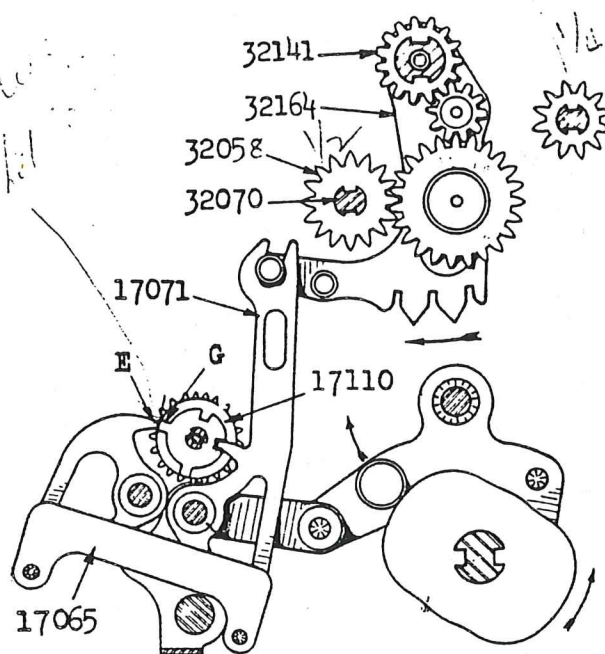


FIG. 430

### EXAMPLE:

10. If a No. 8 numerical key has been depressed the tip (E) of the forward feeler finger of the third Selection Assembly 17065 will limit on the high point (G) on the front of Cam 17110. The Feeler Finger 17071, of Assembly 17065, will rock Selection Lever 32164, of Assembly 32135, forward where the gear train carried on that lever will mesh with the No. 8 Gear 32058 on the One-Half Turn Shaft 32070. All other selection levers of Assemblies 32135 and 32170 will be located in a neutral position and therefore the gear trains carried on them will not engage with any of the gears on the one-half or one-quarter turn shafts. Fig. 430.

11. Should the No. 3 numerical key have been depressed the tip (D) of the Feeler Finger 17071 of the third Selection Assembly 17065 would limit on the high point (F) of the rear of Cam 17110. This

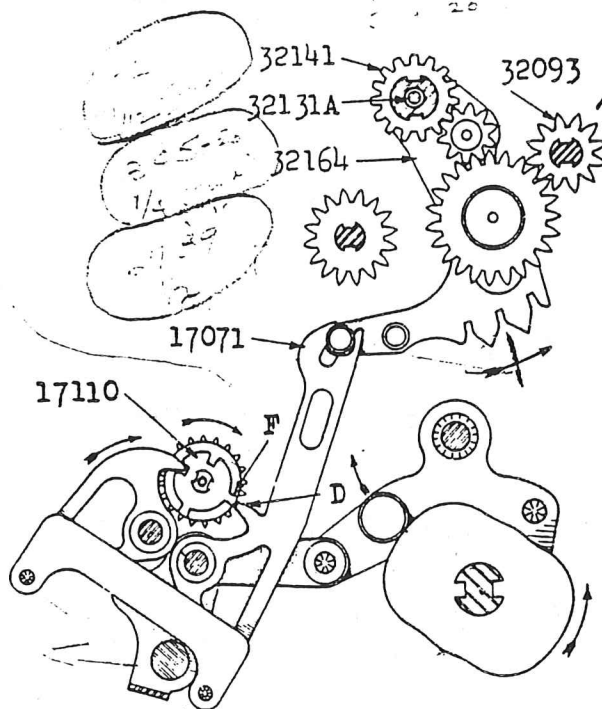


FIG. 431

feeler finger, as explained in paragraph 5, page 405, will cause Selection Lever 32164, of Assembly 32135, to rock rearward about Pivot Gear Shaft 32131A where the gear train carried on it will mesh with the No. 3 Gear 32093 of the one-quarter turn shaft. As explained in paragraph 10, above, all other selection levers will be positioned and held in a neutral position and thus the gear trains carried on them will not mesh with the gears on either the one-half turn shaft or the one-quarter turn shaft. Fig. 431.

12. As the machine continues to operate it will be observed that all Pivot Gears 32141 in the active Assembly 32135 and the wide tooth Pivot Gear 32142 will be driven the selected number of teeth and will transmit this movement to the Product Carriage for each cycle of the machine.



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## ACTUATOR UNIT Cont'd

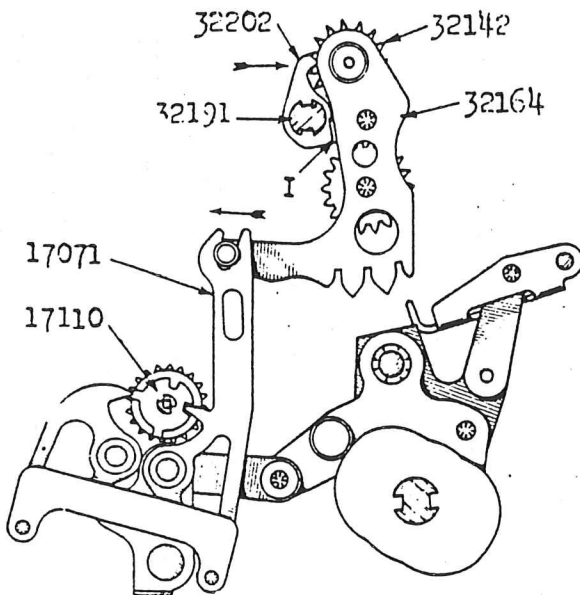


FIG. 432

13. In order to positively lock Pivot Gears 32142 when they are not rotating and to insure the proper alignment of the pivot gears for meshing with the gears of the lower carriage, there is provided in each order a Pawl 32202 which is loosely keyed on Shaft 32191. On the lower rear of Pawl 32202 is an ear (I) which is in line with Selection Lever 32164, of Assembly 32170, ("0" and "1" selections). When there is no numerical key depressed in a column that order is then in a zero selection, Segment 17130 and Cam 17110 being spring returned to their zero positions. As the machine operates the Feeler Finger 17071 positions the Selection Lever 32164, of Assembly 32170, to its forward position. Selection Lever 32164 contacts the ear (I) of Pawl 32202 causing the pawl to pivot about Shaft 32191 and engage with Pivot Gear 32142 (wide tooth) thus preventing rotation of the pivot gear in that order. However, should

a No. 1 numerical key be depressed the Selection Lever 32164, of Assembly 32170, would then be rocked to its rear position; and any other numerical key depression would cause the selection lever to be rocked to its neutral position. Whenever the selection lever is located in its neutral or rear positions it does not contact the ear (I) and Pawl 32202 is free to withdraw from Gear 32142 permitting that gear to rotate in accordance with the selection in the order. (Fig. 432)

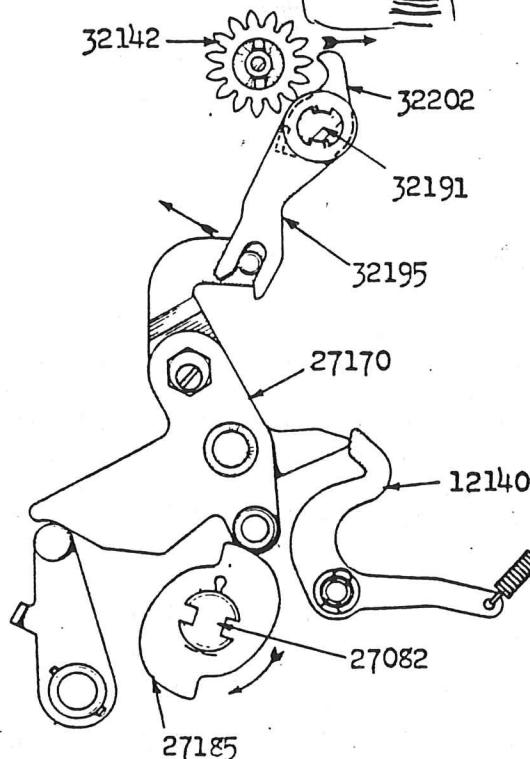


FIG. 433  
VIEW FROM LEFT

14. At the beginning of the machine operation the Setting Shaft 27082 rotates the Cam 27185 (on the left end of the setting shaft) causing the Follower 27170 to rock the Pawl Release Lever 32195 which being keyed to Shaft

# MARCHANT

## ACTUATOR UNIT . Cont'd

32191, rocks that shaft allowing all Pawls 32202 to withdraw from mesh with Gears 32142 with the exception of those pawls blocked from operation by a "0" selection as previously described, paragraph 13, page 411. Shaft 32191 is held in the position in which it releases Pawls 32202 during actuation (that is while the main clutch is rotating) by Latch 12140 holding Follower 27170 which in turn holds Lever 32195. Fig. 433.

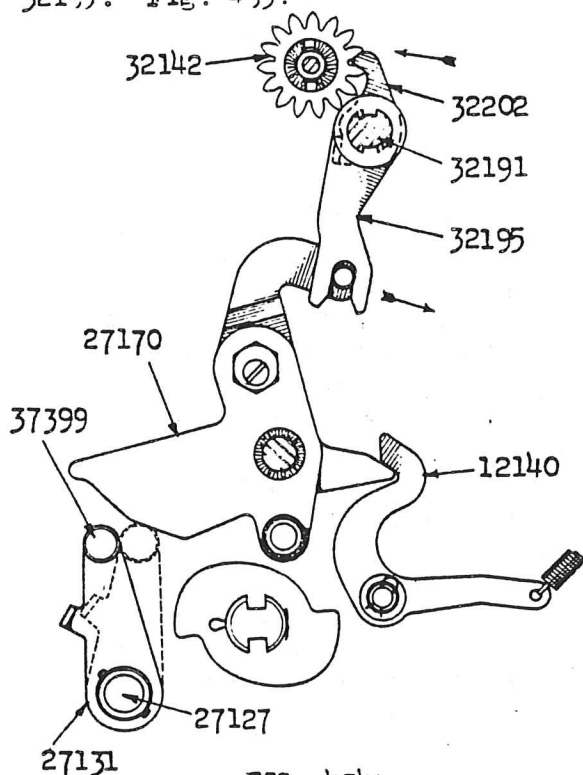


FIG. 434  
VIEW FROM LEFT

15. The restore clutch cycle which automatically terminates each calculation actuates Shaft 27127, rocking Lever 27131 forward. (This forward movement of the lever unlatches the carriage). The Roller 37399 on the Lever 27131 rocks the Follower 27170 forward causing the Lever 32195 to rock Shaft 32191 thus engaging

Pawls 32202 with the teeth of Gears 32142. Latch 12140 then holds Follower 27170 thus keeping the gears accurately aligned until the next operation is started. (See paragraph 6, page 447). Fig. 434.

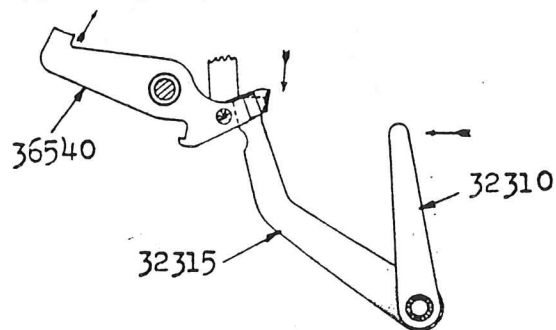


FIG. 435  
VIEW FROM LEFT

16. A centralizing mechanism is provided on the left side of the machine and operates on Shaft 32070 to insure that Gears 32142 are brought into their approximately correct position before being engaged by Pawls 32202. As the Actuator Unit starts to function, Centralizers 32300 are forced out of the notches in Cam 32040 by the rotation of Shaft 32070. Centralizers 32300 are held open until near the end of the last main clutch cycle by the action of Latch 32306 which is pulled by Spring 7028 so that shelf (J) lies between abutments (K) on Centralizer 32300. See Fig. 436. The dropping of Dog 36540 into the notch of the Main Clutch 52520 forces Lever 32315 and Lever 32310, of Assembly 32320, rearward. Fig. 435. Lever 32310 rocks Latch 32306 upward out of the steps in Centralizers 32300. When Cam 32040 approaches its normal position Centralizers 32300

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## ACTUATOR UNIT Cont'd

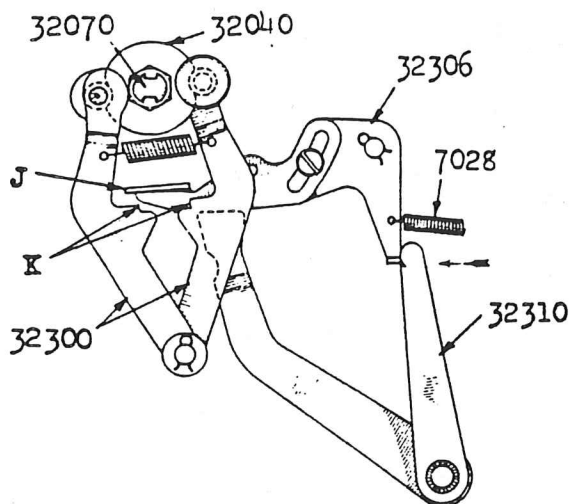


FIG. 436  
VIEW FROM LEFT

drop into the notches of the Cam 32040 thus acting to force Shaft 32070 accurately into its full cycle position and thus insure alignment of Pawls 32202 in the correct tooth spaces of the Gears 32142. Fig. 436.

17. The carriage must be accurately aligned laterally whenever the lower carriage is dipped for actuation and before division sensing is started, and this alignment must be held until the carriage rises. At the beginning of the setting clutch cycle the

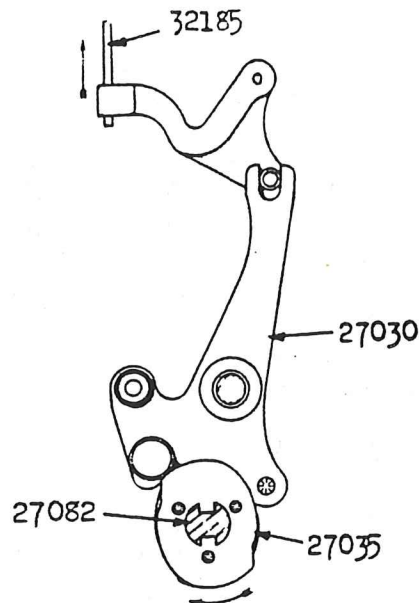


FIG. 437  
VIEW FROM LEFT

Lock 32185 is rocked upward between the lower carriage braces by the action of the Cam Follower 27030. This action will cam the carriage laterally into place should it be out of position. Continued movement of the Follower 27030 lowers the Lock 32185 simultaneously with the carriage dip, with the result that the Lock 32185 remains between the lower carriage braces and the lateral alignment of the carriage is maintained until the carriage rises. Fig. 437.



# MARCHANT

## CARRIAGE

1. The carriage consists of two separate sections, the Product or Lower Carriage and the Counter or Upper Carriage. The lower carriage engages Gears 32142 of the Actuator Unit during the machine operation and accumulates in its dials the product in multiplication, as well as the sum in addition, and the difference in subtraction. The upper carriage registers the number of machine cycles and may be considered as an item counter. In multiplication it displays the multiplier, and in division the quotient.

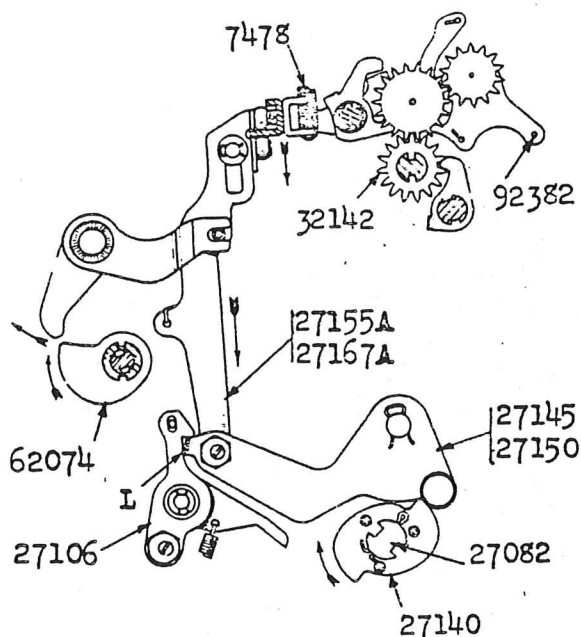


FIG. 447  
VIEW FROM LEFT

2. At the beginning of the machine operation Setting Shaft 27082 rotates Cams 27140 which actuate Cam Followers 27145 and 27150 to pull down the two Arms 27155A and 27167A thus dipping the lower carriage about Shaft 92382 into mesh with the Actuator Unit. The carriage is held in its dipped

position by Latches 27106 hooking over ears (L) of Followers 27145 and 27150. After the completion of the main clutch operation a restore cycle automatically takes place. At the start of the restore cycle Latches 27106 are released and the carriage is raised to its normal position by Springs 7478, checked and controlled to a smooth, gradual rise by Restore Cam 62074. (See 62000 SECTION, RESTORE MECHANISM, paragraph 6, page 447). Fig. 447.

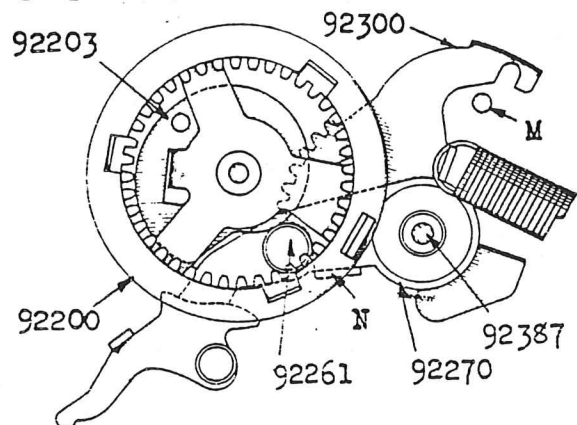


FIG. 448

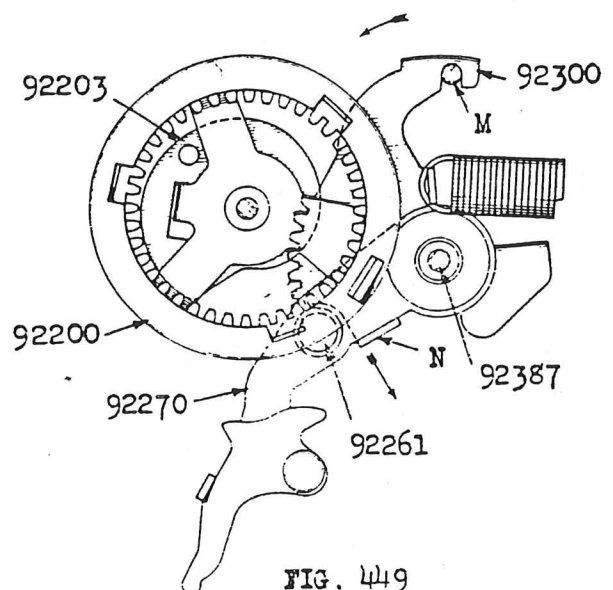


FIG. 449

# MARCHANT

## CARRIAGE Cont'd

3. As the carriage dips about Shaft 92382, Segments 92300 are cammed forward around Shaft 92387 by Shaft (M) (part number 92382 is used for this part also), engaging the upper arm of the segments, thus rocking down the ear (N) of Segment 92300, which normally holds Roller 92261, of the Lever 92270, against Snail Cam 92203, of Dial 92200, thus allowing Roller 92261 to clear the snail cam so as to permit rotation of the dial in either direction. Fig. 448 and Fig. 449.

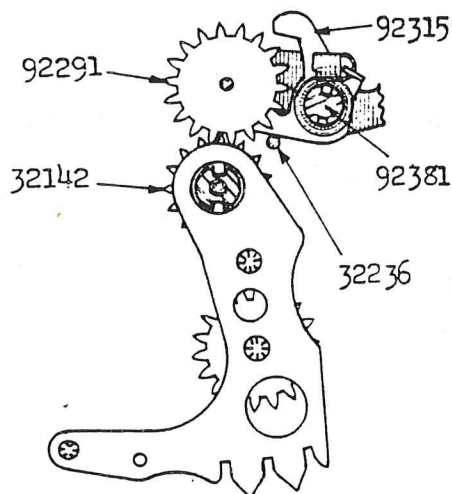


FIG. 450

4. When the carriage is dipped the carriage Gears 92291 in line with the keyboard columns, mesh with Gears 32142 of the Actuator Unit. The tails of the corresponding Pawls 92315 contact Shaft 32236 and are thereby rocked upward around Shaft 92381 so as to clear Gears 92291. Note: Shaft 32236 is only long enough to engage the pawls of the carriage orders in line with the keyboard so that those in all other orders will remain in mesh with Gears 92291 and prevent rotation. Fig. 450.

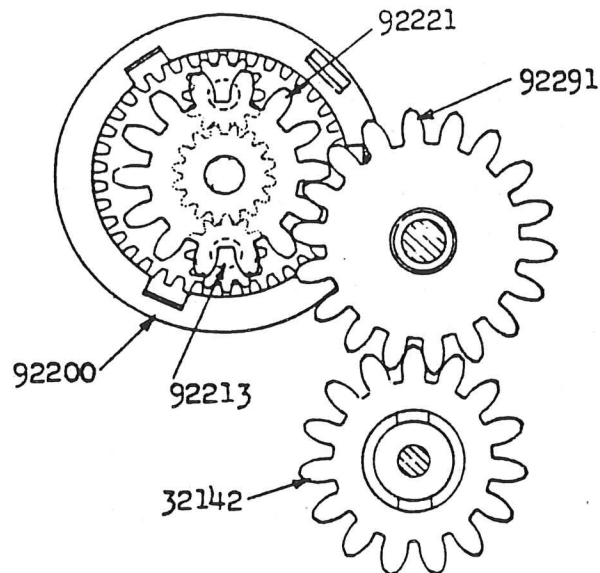


FIG. 451

5. As each active Pivot Gear 32142 rotates, the corresponding Carriage Gear 92291 is turned and transmits the amount set up on the keyboard to Gear 92221 with which it meshes. Rotation of Gear 92221 is transmitted to Dial 92200 by means of Planetary Gears 92213, as will be more fully described, thus registering the keyboard set-up. Fig. 451.

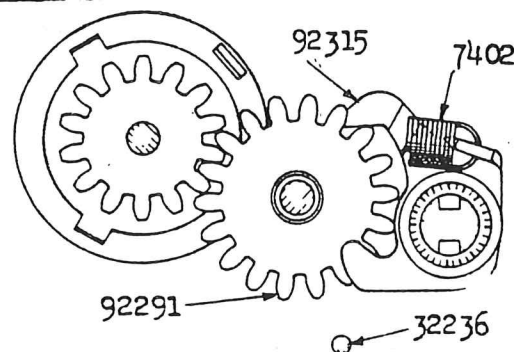


FIG. 452

6. When the carriage rises, the tails of Pawls 92315 move up away from Shaft 32236 and are pulled into mesh with Idler Gears 92291 by Springs 7402 thus accurately retaining the selection transmitted to the carriage. Fig. 452.



# MARCHANT

CARRIAGE . Cont'd

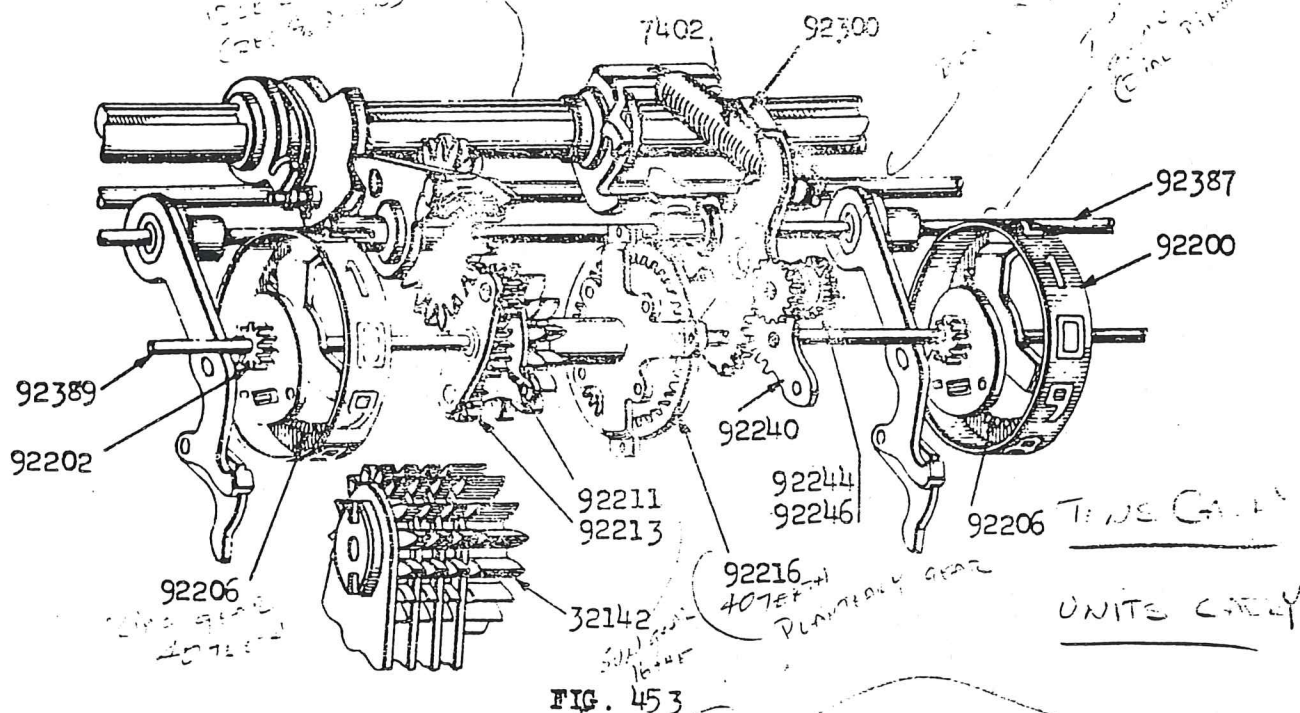


FIG. 453

7. The speed and quietness of the "D" Model is attained by eliminating the idle portions of each cycle, which, in older types of machines are reserved for the operations of "carrying" from column to column. In this machine, with the lower carriage dipped for calculation, all operations including "carrying" are continuous and each dial moves at a rate that is the sum of that required for registering the digit set up in line with the dial plus the "carry" rate which is 1/10th of a movement of the dial to the right. For instance, if the figure "6" is set on the keyboard the dial in the same line moves six figures per cycle, but if the set up is "6.5" the dial in the line with the "6" advances "6.5" figures per cycle. The "6" figure advance is transferred directly into the dial from the Actuator Unit while the additional half figure of movement is transmitted from the dial to the right.

8. Two planetary systems of gears are provided between each of the Dials 92200. One of these is used for combining the selection from the Actuator with the "carry" movement from the dial to the right. It includes Ring Gear 92206 (of Dial 92200), Sun Gear 92211 and Planetary Gears 92213 (which are on the left end of Assembly 92210 and mesh with Ring Gear 92206). Fig. 453.

9. Sun Gear 92211 is rotated 1/4 turn around Shaft 92389 by the dial to the right for each figure of "carry" movement, that is for each complete rotation of the dial to the right, while the centers of the Planetary Gears 92213 are revolved 1/14th of a turn about Shaft 92389 in the opposite direction by the Actuator Unit for each figure of movement. Ring Gear 92206 is accordingly rotated 1/10th of a turn for each figure of either movement. Fig. 453.

# MARCHANT

## CARRIAGE . Cont'd

10. The second planetary system between each dial consists of Pinion 92202 (a part of the Dial Assembly 92200), the Idler Gears 92244 and 92246 (parts of Assembly 92240), and the Ring Gear 92216 of the Assembly 92210. This planetary system is provided for the purpose of introducing, at the close of each calculation, as the lower carriage rises, a correction movement which will eliminate the effect of partially completed "carry" operations, so that the proper result figures in the dials will be directly aligned with the openings of the carriage cover when the lower carriage has reached its full up position. The required amount of this correction movement being equal to the amount of any partially completed "carry" is therefore equal to  $1/10$ th of the reading of the next dial to the right. As previously described (paragraph 3, page 415), when the carriage is dipped the Segments 92300 are rocked forward about Shaft 92387 by Shaft (M). The gear teeth of the Segments 92300 mesh with segment teeth of the Rocking Idler Arm Assemblies 92240 causing those assemblies to rock rearward about Shaft 92389 and thus hold the Idlers 92244 and 92246 on Assembly 92240 in their rearward position during a calculation. Fig. 453.

11. When the calculation is completed and the carriage rises, the Segments 92300 are pulled to the rear about Shaft 92387 by the Springs 7402 until the Rollers 92261 contact the Snail Cams 92203 and further movement is prevented. The snail cam is so shaped that for each dial reading it will allow the Roller 92261 to move up from

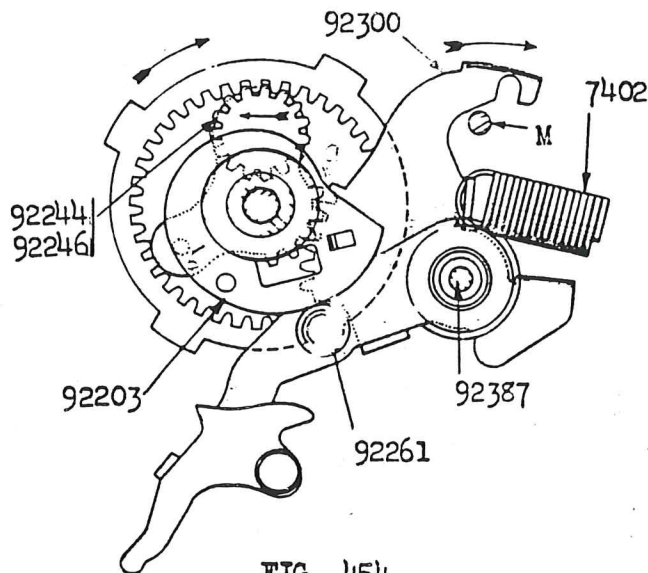


FIG. 454

the position into which it is positioned during calculation by an amount proportional to the dial reading. Thus the Segment 92300 rocks the Idler Gears 92244 and 92246, of Assembly 92240, forward just enough to back out of the next dial to the left as much "carry" movement as would be produced by the dial to the right in moving from "0" to its actual reading. Fig. 454.

12. For instance, with all of the dials of the Lower Carriage at "0" set the figure "6" in the keyboard, depress the add bar and operate the machine manually. It will be noted just before the carriage rises, that the dial in line with the set-up will register "6" while the adjacent left dial will have advanced slightly over halfway between "0" and "1", or, in reality,  $6/10$ th. As the carriage rises this latter dial will be backed up  $6/10$ th of a position thus returning it to "0" again.

13. The "transfer" of a series of dials from "0" to "9" is accomplished in the following manner: Snail



# MARCHANT

## CARRIAGE . Cont'd

Cam 92203 is so shaped that the "zero position" is at an extreme high radius and the "nine position" is at an extreme low radius. Thus, for example, if all dials in the lower carriage are at zero and a figure "1" is subtracted from the first dial this dial will be rotated from "0" to "9" and the second dial backed up 1/10th of a position. As the carriage rises Segments 92300 are pulled to the rear about Shaft 92387 by Springs 7402 until Rollers 92261 contact the snail cams of the various dials. Because the first dial has been rotated from "0" to "9" the Roller 92261 in that order moves in to contact the "nine position" on Snail Cam 92203, which is its point of smallest radius, allowing Segment 92300 to rotate far enough to drive the next dial to the left back 9/10ths of a position, which, combined with the 1/10th it had already been directly backed up, moves it back one full position from a "0" to a "9" as described more fully under paragraphs 10, 11, and 12, page 417. This next dial then allows Roller 92261 in that order to drop down to the "nine position" on its Snail Cam 92203 thus rotating the next dial from "0" to "9". In this manner a "carry wave" is instituted which rotates each dial one full figure successively from right to left until all dials in the lower carriage stand at a nine position.

14. The "transfer" of a dial from "9" to "0", as in adding one to nine hundred and ninety-nine and totaling one thousand, is accomplished in an entirely different manner as follows: As the lower carriage is dipped for calculation, Segments 92300 are cammed for-

ward as described in paragraph 3, page 414. This movement of the segment is the reverse of the movement as described in paragraph 11, page 417. Consequently each dial reading is advanced, during the carriage dip, by 1/10th of the amount appearing in the dial to the right of it, but since that dial, in turn, is being simultaneously advanced by 1/10th of the value appearing in the dial to its right, the net result is that each dial is advanced by the fraction of a position represented by the decimal value of the figures appearing on all the dials to the right of it. Thus if the carriage dials originally read 0-9-9-9.0, after the carriage is fully dipped the first of these dials will be advanced 0.999 of a position, or practically from "0" to "1", the second 0.99 of a position, or practically from "9" to "0", the third 0.9 of a position, or 9/10ths of the way from "9" to "0" and the other two will remain unchanged by the carriage dip. Then if a figure "1" is added to the first nine on the right it will be moved from "9" to "0" thus bringing the high part of the snail cam under the Roller 92261 preventing its returning to its former position when the carriage rises. At the same time the next dial to the left is advanced 1/10th of a position, the next 1/100th of a position, and the next 1/1000th of a position, bringing them to exactly 0, 0 and 1 respectively and leaving the result displayed as 1000.00, with nothing to be backed out as the carriage rises as these dials all have zeros to the right of them.

15. The Snail Cam 92203 is held at its normal position in relation to

# MARCHANT

## CARRIAGE . Cont'd

its dial by Spring 7303, allowing the snail cam to be displaced from its normal position under the following conditions: With the dial at a "9", Roller 92261, on Roller Lever 92270, is at the extreme low point of the snail cam. If, for example the thirteenth dial stands at "0" and the fourteenth dial stands at "9", the "9" in the fourteenth dial will not be displaced when the carriage is dipped. If, however, the thirteenth dial stands at any figure above "0" the "9" in the fourteenth dial will be displaced by 1/10th of the figure in the thirteenth dial. If the figure in the thirteenth dial is either a 7, 8, or 9 the displacement of the fourteenth dial (i.e. the amount it is caused to rotate towards "0" from "9") is so great as to cause an interference between the path of the Roller 92261 dropping out and the snail cam rotating to its new position. The snail cam being spring-mounted yields, forcing the roller out until the zero height or extreme high point of the snail cam is reached at which point the snail cam can then snap back to its normal position. In Fig. 455, representing the fourteenth dial cam, the Roller 92261 is shown at a "9" position. When the carriage dips the Roller Lever 92270 is rocked about Shaft 92387 (see paragraph 3, page 415) moving the Roller 92261 to position (P). The thirteenth dial being at a "9" position causes the fourteenth dial and its cam to move from its "9" position 9/10ths of the way to its "0" position, in which position the Roller 92261 will be at position (Q) in relation to the cam. The dotted line between the Roller 92261 at the "9" posi-

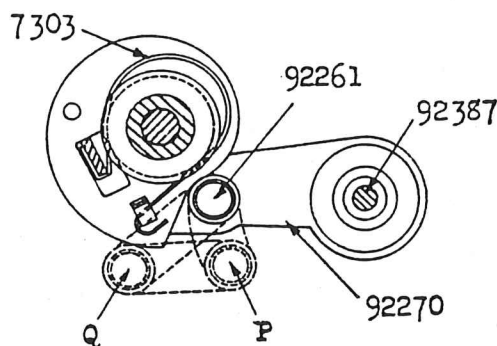


FIG. 455

tion and the position (Q) shows the amount of interference between the roller and the snail cam which is taken care of by the yielding of the Spring 7303.

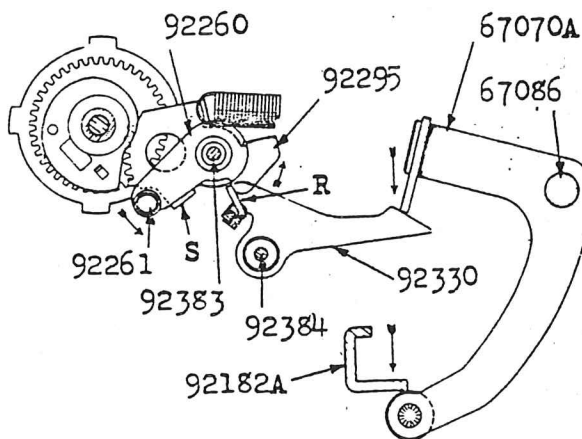


FIG. 456

### COUNTING REGISTER:

16. The mechanism of the Counting Register (Upper Carriage) is, in general, similar to that of the Lower Carriage. However, a different method must be provided for rocking the Segments 92295 preparatory to calculation than that employed to actuate Segments 92300 of the Product Carriage. Also, since the Roller Levers 92260 need only be



# MARCHANT

## CARRIAGE . Cont'd

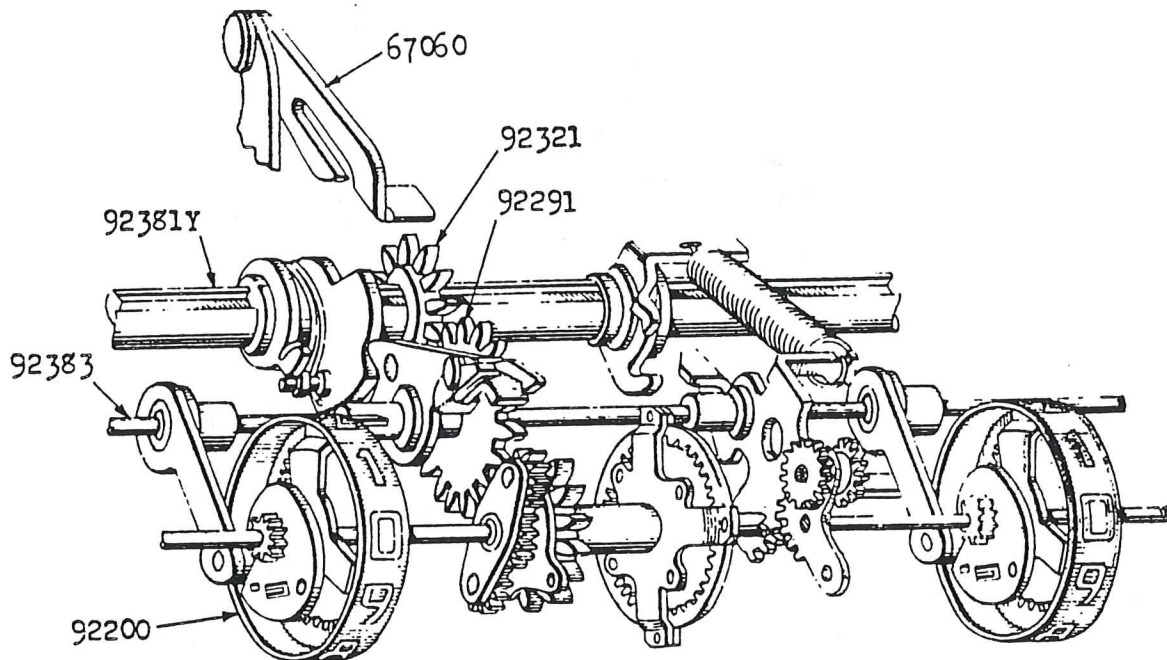


FIG. 457

rocked clear of the dial snail cams in the counting order and to the left of that position, a Gate 67070A is provided which rocks only the Segments 92295 to the left of the active dial. This gives true readings in the active dial during operation. Fig. 456.

17. As the carriage dips during a machine operation Gate 67070A is rocked downward about Shaft 67086 by the Gate 92182A (a part of the dipping carriage) and depresses the tails of the Levers 92330 in all columns to the left of the counting order and thus rocks those levers down about Shaft 92384. The ears (R) on Levers 92330 contact the Segments 92295 rocking them about Shaft 92383 thus moving ears (S) on Segments 92295 so that the Levers 92260 are permitted to position the Rollers 92261 clear of the snail cams on the dials. This frees the dial in the counting order to operate and those to

the left of it to receive the "carry" movement. (See Fig. 456).

18. Each main clutch cycle of the machine operates the Finger 67060 to engage the Gear 92321 and turn it one tooth forward or backward around Shaft 92381Y (depending on the position of the Counter Operating Mechanism, a description of which will be found under that subject, paragraph 5, page 450). This action is such that an "overthrow" even at high speeds is prevented. Fig. 457.

19. The Gear 92321, rotating on Shaft 92381Y, meshes with the Idler 92291, rotating on Shaft 92383, which transmits the motion to the Dial 92200 through a planetary system as in the Product Carriage, advancing the dial one digit. The "carry" movement from column to column is the same as has been previously described. Fig. 457.

# MARCHANT

## POWER CLEARANCE

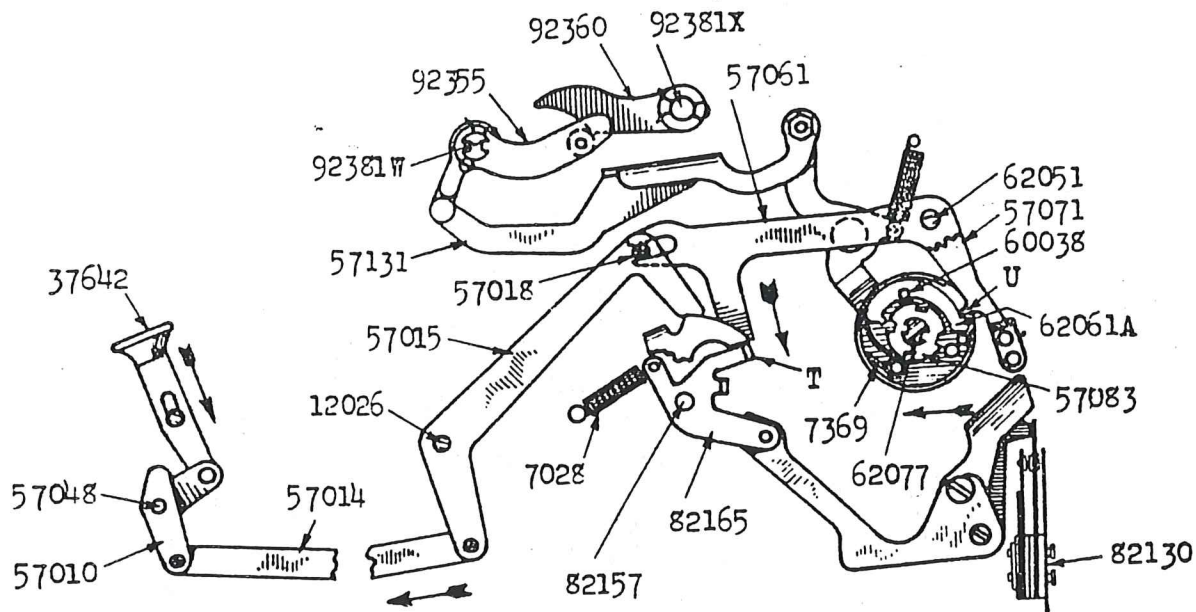


FIG. 467

### Lower Carriage:

1. A depression of Middle Dial Key 37642 rocks Bell Crank 57010 forward about Shaft 57048 pulling Link 57014 forward, which link rocks Lever 57015 down about Stud 12026. Stud 57018, on the Lever 57015, being embraced by the fork of Lever 57061, rocks that lever down about Shaft 62051 to contact ear (T) of Lever 82165 and rocks that lever down about Shaft 82157 to close Starting Switch 82130, (see paragraph 5, page 428, Fig. 494). Fig. 467.

2. Dog 57071, being connected to Lever 57061, is therefore also rocked about Shaft 62051 and the nose (U) of the dog is withdrawn from contact with Clutch Dog 62061A thereby allowing Spring 7369 to rock that dog about Stud 60038 and engage Disc 57083 which is keyed to Shaft 62077. This has the result

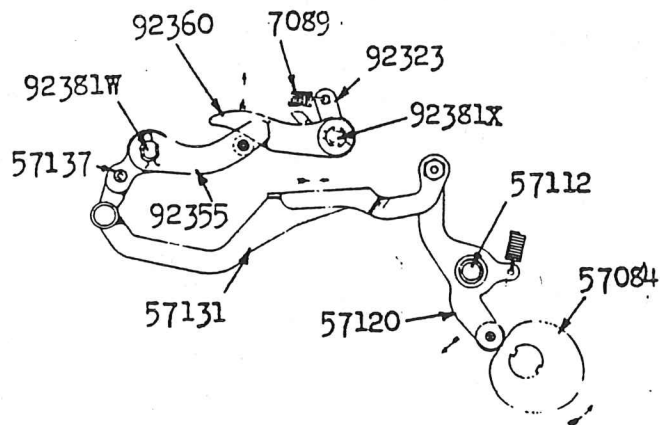


FIG. 468

of coupling Clutch Assembly 57080 to the rotating Shaft 62077 thus causing rotation of the clutch. See Fig. 467. Cam 57084 which is keyed to Clutch Assembly 57080, rotates with it, causing Cam Follower 57120 to rock about Shaft 57112 pulling Link 57131 rearward and then letting it gradually restore. Fig. 468.



# MARCHANT

## POWER CLEARANCE . Cont'd

3. When Key 37642 is released Dog 57071 is rocked forward about Shaft 62051 by Spring 7354, so that as the clutch completes its turn, the nose (U) of the dog contacts Clutch Dog 62061A forcing that to rock about Stud 60038 and disengage from the driving Disc 57083 thus stopping rotation of Clutch Assembly 57080. Spring 7354, acting on Lever 57061 and the linkage previously described, restores Key 37642 to normal position. As the Lever 57061 rises to normal and removes its pressure from ear (T) of Lever 82155 Spring 7028 pulls the lever upward to open Starting Switch 82130, (see paragraph 5, page 428). See Fig. 467.

4. When Link 57131 is pulled rearward, as described in paragraph 2, above, it rocks Lever 57137 rearward and this lever being keyed to Support Shaft 92381W rocks that shaft. Levers 92355 (one on each end of the carriage) being keyed to Shaft 92381W, are rocked upward and the rollers on these levers force the Levers 92360 (one on each end of the carriage) upward to rock the Clear Shaft 92381X. After the completion of the upward stroke Lever 92323, under tension of Spring 7089, returns Clear Shaft 92381X to normal. See Fig. 468.

5. In each column of the carriage there is a Lever 92335 keyed to Clear Shaft 92381X, and as that shaft is rocked Lever 92335 cams Zero Stop 92280 forward about Shaft 92387, bringing the ear (V) in position to block the lug (W) on Dial 92220 at its "zero" position and also to block Ring Gear 92210. Fig. 469.

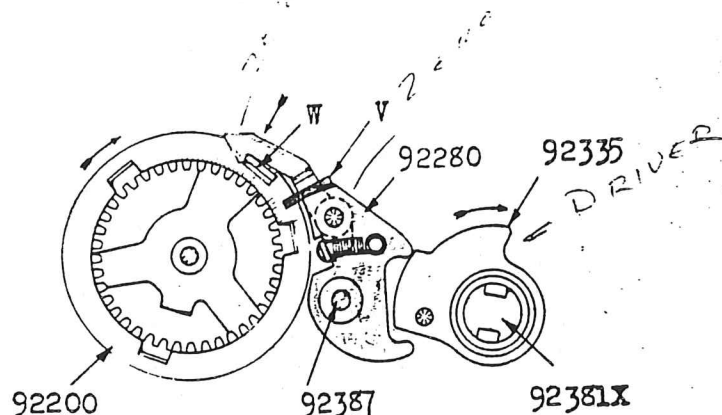


FIG. 469

6. The rotation of Clear Shaft 92381X also causes Lever 92335 to contact with the ear (X) on its respective Pawl 92315 and rotate the pawl, about Shaft 92381X carrying tip (Y) of the pawl clear of Gear 92291 whereupon the foot (Z) of the pawl contacts the ear (a) of Segment 92300 rocking that segment about Shaft 92387. The movement of Segment 92300 rotates the Assembly 92240, containing Idler Gears 92244 and 92246, rearward about Shaft 92389 thereby carrying Ring Gear 92210 rearward until one of its lugs contacts with the ear (V) on Zero Stop 92280, thus blocking further movement of the ring gear. Fig. 470. Further movement of Assembly 92240 causes Idler 92246 to roll rearward inside of the blocked ring gear, which causes Idler 92244, integral with 92246, to spin rearwardly Sun Gear 92202 with which it meshes. See Fig. 470. This gear being integral with the dial thereby rotates it about Shaft 92389 until its lug (W) limits against the ear (V) of Zero Stop 92280 leaving the dial at "zero." Zero Stop 92280 has attached to it a spring-operated



# MARCHANT

## POWER CLEARANCE Cont'd

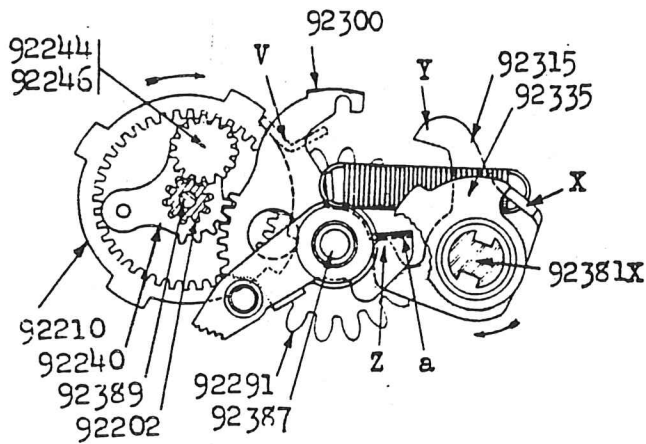


FIG. 470

hook under which the lug (W) snaps as the dial reaches its "zero" position and which prevents the dial from rotating back out of that position, during the return of Clear Shaft 92381X, until Pawl 92315 has seated in Gear 92291. Zero Stop 92280 is then retracted to a normal position clear of the dial lug (W). See Fig. 469.

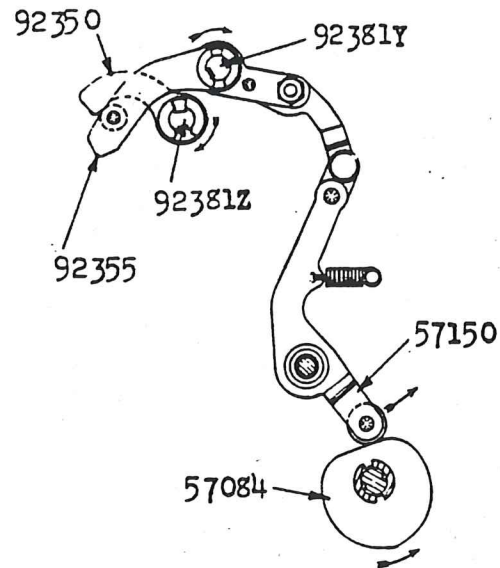


FIG. 471

### Upper Carriage:

7. The clearance of the Upper Carriage operates in the same manner as the Lower Carriage except that a depression of the Upper Dial Key 37643 acts to engage Clear Clutch 57095. As a result Cam 57084, keyed to Clutch 57095, causes its Follower 57150 to rock the Upper Support Shaft 92381Y which in turn rocks the Upper Clear Shaft 92381Z by means of Levers 92355 and 92350 on each end of the carriage. The clearance of the dials is the same as described in the clearance of the Lower Carriage. Fig. 471.

# MARCHANT

## SETTING MECHANISM

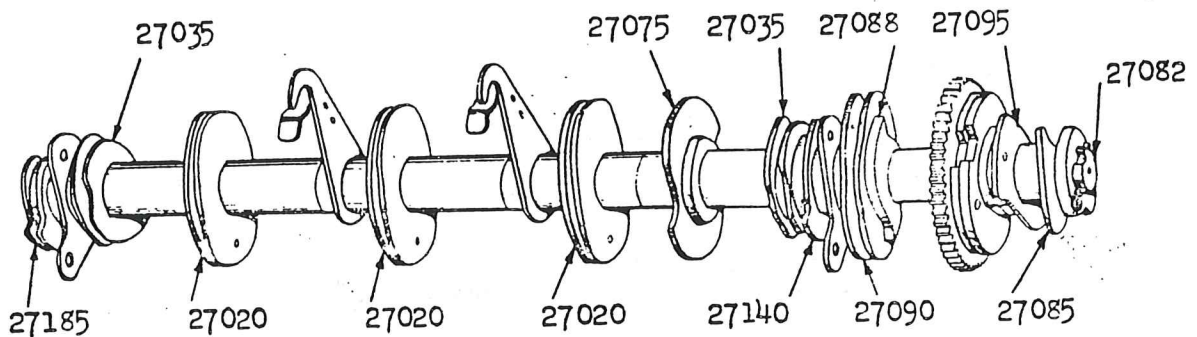


FIG. 481

1. In order to position certain parts and sections preparatory to adding, subtracting, etc., a Setting Shaft 27082 is provided, together with a Clutch 52525, various cams and cam followers.

2. A depression of the add, subtract, multiply, short-cut, or division keys permits the setting clutch to rotate the setting shaft and cams one-half turn, serving to position the several sections, whereupon the setting clutch is stopped until a new operation is started. (See 52000 SECTION, SETTING AND MAIN CLUTCHES, page 430).

3. Each cam actuates a follower which controls a definite positioning or setting operation, and is assembled on the setting shaft in the order illustrated, from right to left, to perform the following functions: Fig. 481.

Cam 27085 - Actuates the Arm 37595 in order that Lever 37603 may engage and lower the Dog 36540 to open the Main Clutch 52520. (See 52000 SECTION, paragraph 7, page 432. Fig. 507). Arm 37595 also rocks Lever 37371 forward to restore the Lever

37355. (See 37000 SECTION, ADD BAR, paragraph 10, page 438. Fig. 527).

Cam 27095 - Rocks the Bell Crank 37530 to raise the Restore Lever 62025 to clear Latch 62052. (See 62000 SECTION, ADD BAR, paragraph 2, page 445. Fig. 548).

Cam 27088 - Operates the Follower 37570 to release depressed keyboard keys. (See 37000 SECTION, ADD BAR, paragraph 9, page 437. Fig. 526).

Cam 27090 - Is a complementary type of cam in which two cams are assembled into one unit and act on rollers on opposite sides of the cam follower in such a way that whenever one roller is entering a depression on its cam the other roller is meeting a rise on its cam so as to always keep both rollers in contact with their respective cams. This cam operates the

# MARCHANT

## SETTING MECHANISM . Cont'd

Follower 27100 to actuate the Reverse Clutch Mechanism 52425. (See 52000 SECTION, REVERSE CLUTCH, paragraph 13, page 434. Fig. 511); the Follower 27100 also rocks the Lever 37580 which pushes Link 37150 off from Dog 37590, thus allowing the dog to fall back onto Clutch 52525, and limit it to one cycle; causes the Lever 37580 to rock Lever 37385 which in turn raises the Arm 37402 from the Crank 37065 to limit the machine to one plus stroke in division. (See DIVISION, paragraph 28, page 465. Fig. 606); and actuates the Member 22180 to throw the division sensing mechanism in and out of operation. (See DIVISION, paragraph 17, page 460. Fig. 594).

Cam 27140 - Actuates Lever 27145 to dip the carriage. (See 92000 SECTION, CARRIAGE, paragraph 2, page 414. Fig. 447).

Cam 27035 - (Complementary type) Rocks Follower 27025 to retract the Gate 27046 from Selection Levers 32135 during selection and to then re-engage it. (See 32000 SECTION, ACTUATOR UNIT, paragraph 9, page 409. Fig. 429).

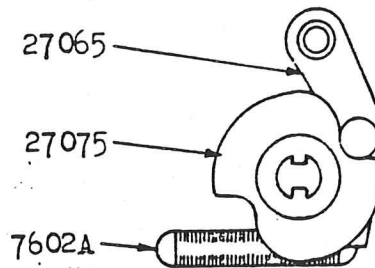


FIG. 482

Cam 27075 - In conjunction with the Lever 27065 and the Spring 7602A this cam serves to centralize and locate the entire setting line in a neutral position. Fig. 482.

Cam 27020 - (Complementary type) Three of these cams (two in 8 bank machines) rock Followers 27005 to actuate the Feeler Shaft 17046 and thereby set up the keyboard selections in the Actuator Unit. (See 17000 SECTION, SELECTION UNIT, paragraph 3, page 404. Fig. 413).

Cam 27035 - (Complementary type) Actuates the Follower 27030 to retract and then engage Gate 27046 with the Selection Levers 32135 (see third cam above); also raises the Shift Lock 32185 in advance of the carriage dip to definitely position the carriage and prevent lateral movement, and then lowers it again in time with the



# MARCHANT

## SETTING MECHANISM . Cont'd

carriage dip. (See 32000 SECTION, ACTUATOR UNIT, paragraph 9, page 409. Fig. 429).

Cam 27185 - Consists of two duplicates of Cam 27140 assembled into one assembly. The inner one of these cams actuates the Lever 27178 to release Pivot Pawls 32202 from Gears 32142. (See 32000 SECTION, ACTUATOR UNIT, paragraph 14, page 411.

Fig. 433); the outer cam rocks the Follower 27150 to dip carriage. (See 92000 SECTION, CARRIAGE, paragraph 2, page 414. Fig. 447).

4. The 27000 SECTION also includes the mechanism which releases the carriage from a dipped position but inasmuch as this operation is controlled by the restore device it will be described under the 62000 SECTION, RESTORE MECHANISM, paragraph 6, page 447. Fig. 552.

# MARCHANT

## MOTOR UNIT

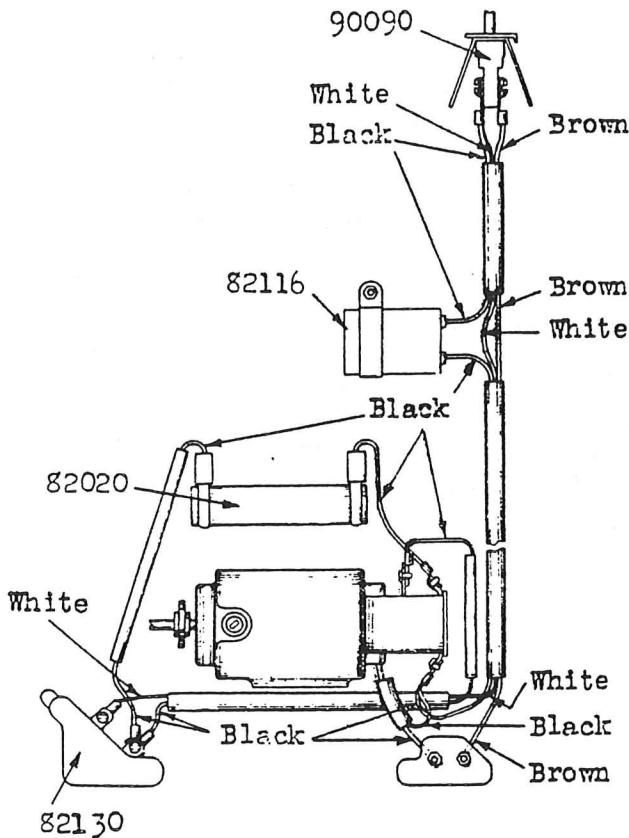


FIG. 492

1. The motor is of the universal type, that is, operating on either direct or alternating current of the voltage specified on the name plate attached to the housing. It operates intermittently rotating only when one of the control keys is depressed. Connected in the circuit is Keyboard Switch 90090, a Resistor 82020, a Capacitor 82116, and a Starting Switch 82130. The details of the wiring arrangement are shown in the illustration. Fig. 492.

2. Attached to the left end of the motor is a governor in which breaker points are controlled by centrifugal force. If the motor starts to operate at more than its governed speed the centrifugal force acting on the Lever 82241

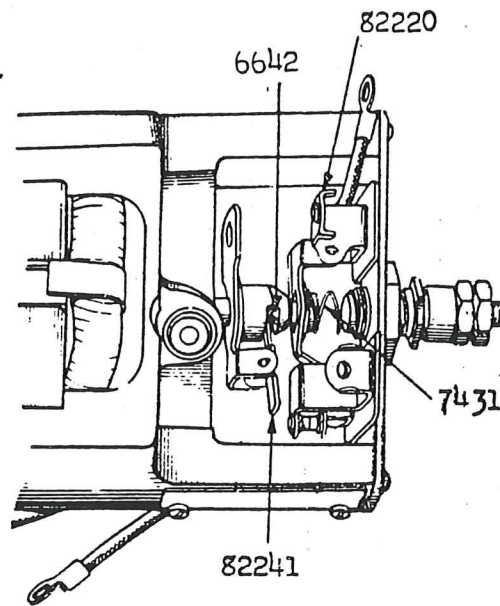


FIG. 493

presses the Ball 6642 against the Lever 82220 with a greater force than that exerted by the Spring 7431 thus separating the contact points. The Resistor 82020 is connected across the governor contact points. When the contact points are opened the circuit is completed through the resistor, thus reducing the speed of the motor. However, a partial motor torque is maintained which reduces the kick of the motor when the governor contacts again close. As soon as the motor slows down and operates below the governed speed, the Spring 7431 closes the contact points thus shorting out the Resistor 82020 and increasing the motor's speed. Governor speed is controlled by varying the tension of the Spring 7431 as outlined on page 287 of Model D Service Manual. Fig. 493.

3. The Capacitor 82116 is employed to reduce any tendency of the current

# MARCHANT

## MOTOR UNIT . Cont'd

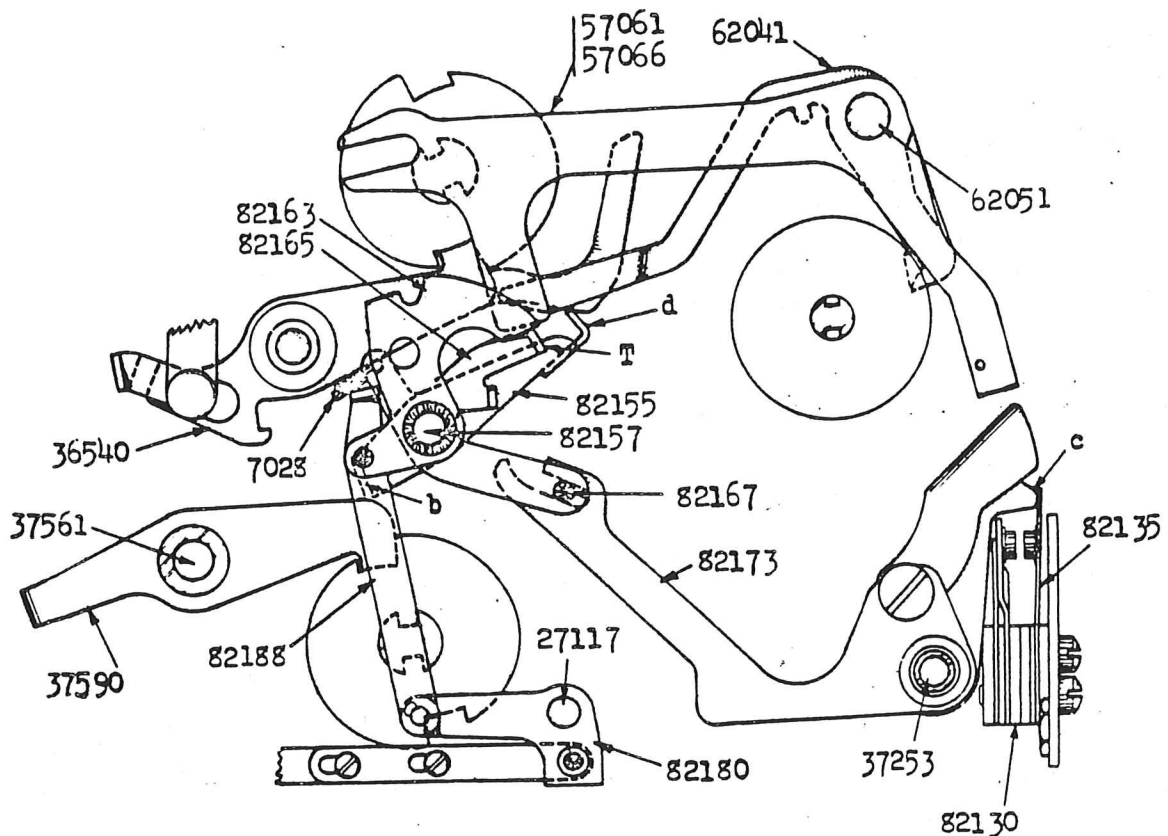


FIG. 494

to arc across the governor contact points, and across the contact points of the Starting Switch 82130.

4. The Keyboard Switch 90090 is provided for the purpose of manually turning the electricity on or off from the supply source.

5. The Starting Switch 82130 automatically closes the motor circuit upon the depression of any control key and opens the circuit when the function of the depressed key has been completed, thus controlling the start and stop of the motor. A depression of the Add, Subtract, Multiply, or Short Cut Bar and also the Division Key causes the Setting

Clutch Dog 37590 to rock about Shaft 37561. (See paragraph 5, page 436, and paragraph 16, page 460). As the nose of the Dog 37590 rises from the notch of the setting clutch it contacts ear (b) of the Lever 82155 causing that lever to rock the Shaft 82157 and the Lever 82163, of Assembly 82150. Lever 82163 contacts ear (T) of Lever 82165 and forces it to rock downward about Shaft 82157 causing the Stud 82167 embraced by the fork of Lever 82173 to rock that lever about Tie Bolt 37253 thus moving nose (c) forward permitting the Switch Spring 82135 to follow forward and close the contact points thus starting the motor. Near the end of the setting clutch



# MARCHANT

## MOTOR UNIT . Cont'd

cycle the Main Clutch Dog 36540 is rocked out from the notch in the main clutch (see paragraph 6, page 436). Before the Setting Clutch Dog 37590 is lowered from ear (b) of the Lever 82155, the nose of the Main Clutch Dog 36540 contacts the ear (d) of the Lever 82155, preventing the opening of the switch. At the completion of main clutch operation the Main Clutch Dog 36540 drops into the notch of the main clutch and the rearward extension of the dog starts the restore clutch. (See paragraph 4, page 446). The forward end of the Dog 62041 contacts the ear (d) of Lever 82155 preventing the opening of the Switch 82130. Thus the Starting Switch 82130 is held closed until the end of the restore cycle when the Dog 62041 moves upward from the ear (d) allowing the Spring 7028 to rock Lever 82165 upward about Shaft 82157 causing the Stud 82167 embraced by the fork of the Lever 82173 to rock that lever rearward about the Tie Bolt 37253 moving nose (c) rearward to contact Switch Spring 82135 forcing it rearward to open the contact points and thus stop the motor. Fig. 494.

6. Depression of either shift key causes the Bail 82180 to rock about Shaft 27117 (see paragraph 2, page 452) and the arm on the bail forces the Link 82188 upward to rock the Lever 82163, of Assembly 82150, which contacts ear (T) of the Lever 82165 and forces it to rock downward about the Shaft 82157 causing the Stud 82167 embraced by the fork of Lever 82173 to rock that lever about the Tie Bolt 37253 thus moving nose (c) forward, permitting the Switch Spring 82135 to follow forward and close the contact points. When the shift keys are released the Spring 7028 rocks the linkage and opens the switch. (See paragraph 5). Fig. 494.

7. Depression of the Middle Dial Key or the Upper Dial Key causes the Lever 57061 or 57066 to rock downward about Shaft 62051 to contact ear (T) of Lever 82165 causing that lever to rock downward about Shaft 82157 and close Switch 82130 as described in paragraph 5. Upon release of the depressed key the Spring 7028 opens the switch. (See paragraph 5). Fig. 494.



# MARCHANT

## DRIVE UNIT

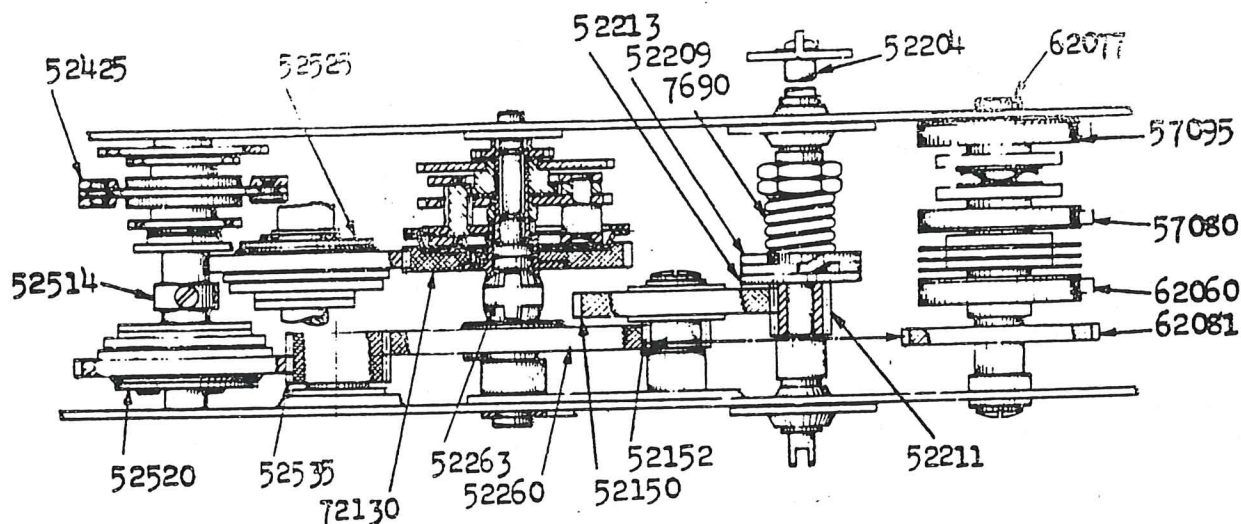


FIG. 504

1. The motor transmits its motion to the Drive Shaft 52204 through Leather Coupling 82099. A slip clutch is provided at this point. The clutch consists of a Clutch Disc 52209 keyed to Shaft 52204 and having angled lugs fitting into recesses in another Clutch Disc 52213 keyed to Pinion 52211. Spring 7690 presses the two clutch discs together. In case of an overload on the machine the angled lugs will be cammed out of their notches and the clutch will slip thus relieving the load on the motor, avoiding damage to the parts which caused the overload, and make a rasping noise which warns the operator to stop the machine. Fig. 504.

2. The rotation of the drive shaft is transmitted through the Pinion 52211 to Idler 52150 with which it is meshed. Idler 52150 is pivoted on Lever 52135 which may be adjusted by means of Eccentric Nut 52156 to insure proper mesh with Pinion 52211 and thus insure quiet operation. Fig. 505.

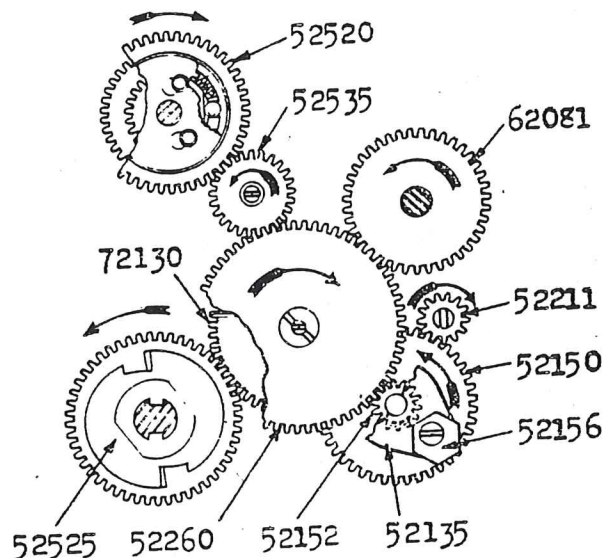


FIG. 505

3. The Idler 52150 is connected by splines with Gear 52152 which meshes with Restore Idler 52260. The Idler 52260 drives the various clutches as follows: it meshes with the Gear 62081 to drive the Restore Clutch Shaft 62077 and through it the Restore Clutch 62060 and Clear Clutches 57080 and 57095; it meshes with the Idler Assembly 52535 which in turn drives the

# MARCHANT

## DRIVE UNIT . Cont'd

Main Clutch 52520; it drives the Planetary Shift Assembly 72125 by means of Drive Coupling 52263; the Gear 72130 of the Assembly 72125 drives the Setting Clutch 52525. In each instance the drive gears of these various clutch assemblies are constantly rotating with the motor, but idle until a clutch is engaged through the depression of a control key or automatically, as in the case of the restore clutch and the planetary shift clutch, when dividing. The main clutch drives the Reverse Clutch 52425 through the Sleeve 52514. See Fig. 504 and Fig. 505.

The Setting Clutch 52525:

4. The depression of any control key with the exception of the clear, shift, and stop keys, withdraws the Dog 37590 from the notches of the setting clutch permitting it to rotate and turn the Setting Shaft 27082 to locate the various sections preparatory to the operation of the Main Clutch 52520.

5. When Dog 37590 is withdrawn from the Setting Clutch 52525, Spring 7254 moves Roller Retainer 52510 forward with respect to the Disc 52530 until the three Rollers 52508 are wedged between the inner circumference of Gear 52529 and the flat faces of Disc 52530. This action locks the gear and disc together and drives the entire clutch mechanism until Dog 37590 drops into the notches and blocks Roller Retainer 52510. The inertia of the moving parts and the action of Centralizer Cam 27075 (see Fig. 482, page 425) serve to continue the advance of Disc 52530 after the roller retainer has been

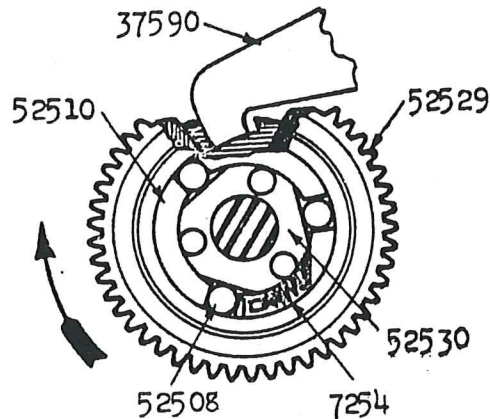


FIG. 506  
VIEW FROM LEFT

stopped by the dog, thus moving the flat faces of Disc 52530 out of wedging relation to the rollers, thus permitting Gear 52529 to idle. Fig. 506.

The Main Clutch 52520:

6. A Main Clutch 52520 is provided to drive the gears of the Actuator Unit, the Counting Mechanism (67000 SECTION, page 449) and to control the Restore Mechanism, (62000 SECTION, page 445).

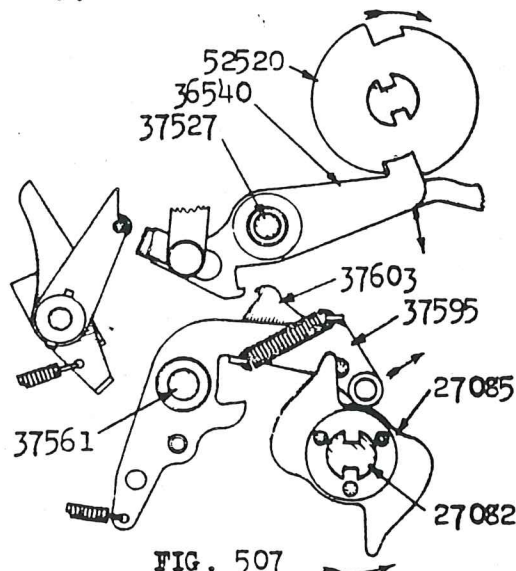


FIG. 507



# MARCHANT

## DRIVE UNIT . Cont'd

7. When the Setting Clutch 52525 is engaged, the Setting Shaft 27082 rotates the Cam 27085 which rocks the Arm 37595 upward about Shaft 37561 causing the Lever 37603, a part of the Arm 37595, to engage and rock the Dog 36540 down about Shaft 37527 thus withdrawing the dog from the notches of the Main Clutch 52520 thus allowing the clutch to rotate. Fig. 507.

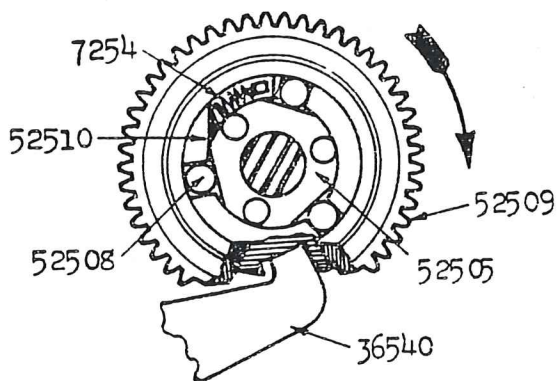


FIG. 508

8. The clutch action is identical with that of the setting clutch as the Spring 7254 moves the Roller Retainer 52510 until the three Rollers 52508 are wedged between the inner circumference of the Gear 52509 and the flat faces of Disc 52505. The gear and disc are thus locked together, driving the main clutch assembly until the Dog 36540 is permitted to drop into the notches, block the roller retainer, unlock the rollers, and allow the Gear 52509 to idle. Fig. 508.

9. An adjustable Centralizer 37536, pivoted on Shaft 37527, and tensioned by Spring 7651, cams the main clutch into a neutral position at the end of a main clutch cycle

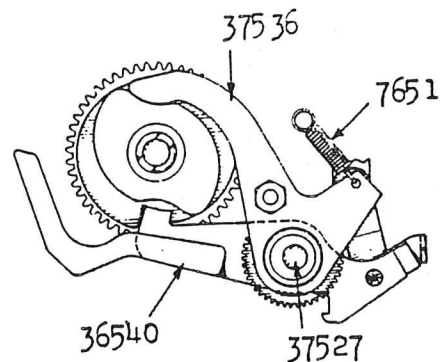


FIG. 509  
VIEW FROM LEFT

to insure that the Dog 36540 seats properly, forcing the Disc 52505 forward, after the roller retainer has been blocked by the dog, to unlock the Rollers 52508. Fig. 509.

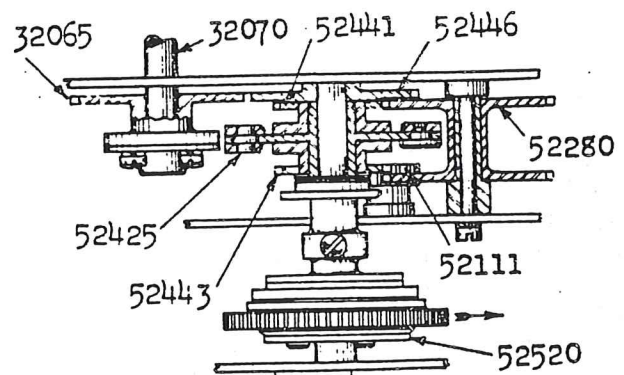


FIG. 510

### The Reverse Clutch 52425:

10. In order to control the direction of rotation of the gears in the Actuator Unit and the Counting Mechanism when performing positive or negative computations, a Reverse Clutch 52425 is provided. As previously mentioned (paragraph 3, page 430), this clutch is driven directly by the Main Clutch Assembly 52520. The main clutch always rotates to the rear. For plus operation of the actuator unit the Gear 32065,

# MARCHANT

## DRIVE UNIT . Cont'd

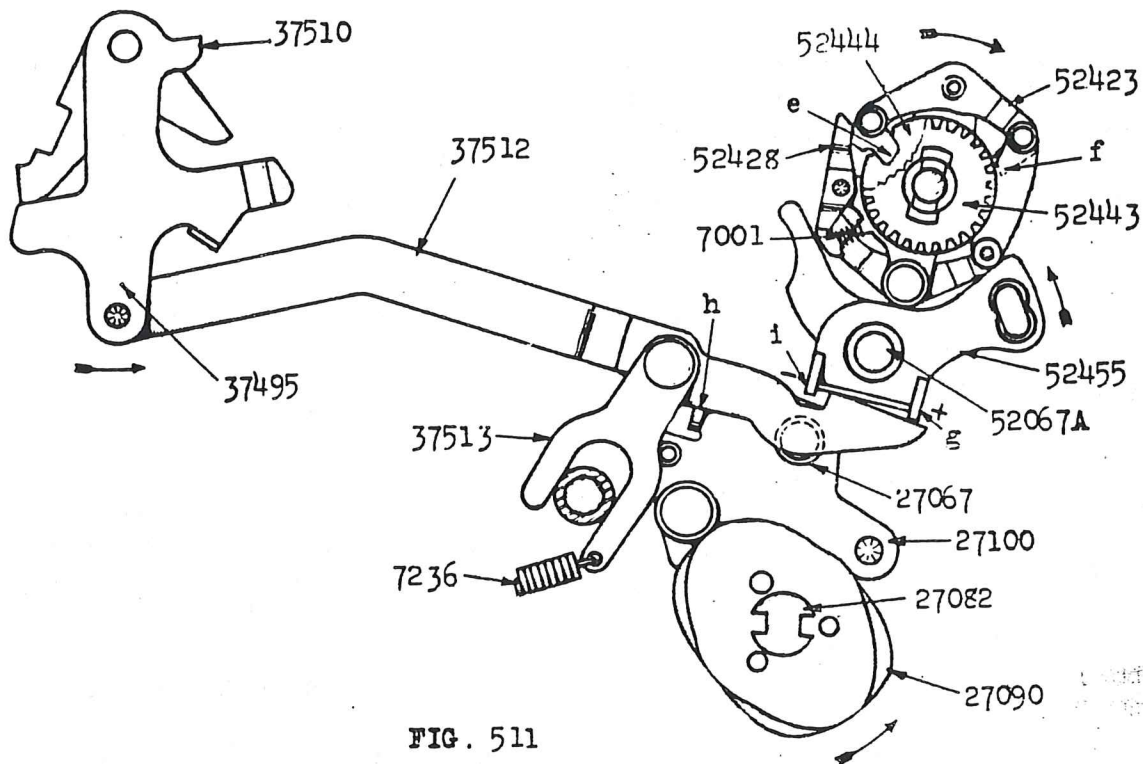


FIG. 511

fastened to the One-Half Turn Shaft 32070, is driven rearward and for minus operation it is driven forward. It will be noted that the double Idler 52280 drives the Gear 32065 through the Gears 52441 and 52446, these two gears being keyed together act as a unit. Therefore the double Idler 52280 and the Gear 32065 always rotate in the same direction; i.e. rearward for plus operation and forward for minus operation. Fig. 510.

11. The Reverse Clutch Dog Assembly 52425, keyed to the main clutch, always rotates to the rear. The Reverse Clutch Dog 52423 has two operating noses which are laterally offset from each other. For plus operation the outer nose (e) of Dog 52423 is positioned in the notch of the outer Disc 52444. This disc is keyed to the Gear

52443 and both disc and gear rotate freely on the hub of Assembly 52425 except when the Dog 52423 is in the notch of the disc driving it rearward. The Gear 52443 drives the double Idler 52280 rearward by means of the Idler 52111. The Idler 52280 drives the Gear 32065 rearward through the Gears 52441 and 52446. See Fig. 510 and Fig. 511.

12. The inner Disc 52444, Gear 52441 and Gear 52446 are all keyed together and rotate freely on the hub of the Assembly 52425 except when the Dog 52423 is in the notch of the disc. For minus operation the inner nose (f) of the Dog 52423 is positioned in the notch of the inner Disc 52444 and driving that disc, Gear 52441 and Gear 52446 cause the Gear 32065 to rotate forward. See Fig. 510 and Fig. 511.



# MARCHANT

## DRIVE UNIT . Cont'd

13. On a plus operation the nose of the Arm 37512, of the Assembly 37495, is positioned under the rear lip (g) of the Fork 52455 by the Spring 7236 pulling on Link 37513. Then as the Setting Shaft 27082 rotates, the Cam 27090 rocks the Follower 27100, about Shaft 27067, causing ear (h) of the follower to contact and raise the Arm 37512, the nose of which contacts the lip (g) and rocks the Fork 52455 about Stud 52067A to force the nose (e) of the Dog 52423 into the notch of the outer Disc 52444 and thus position the reverse clutch for a positive rotation. Pawl 52428, operating by Spring 7001, holds the Dog 52423 in the notch. Fig. 511.

14. On a minus operation the nose of the Arm 37512 is positively

positioned under the front lip (i) of the Fork 52455 (see paragraph 16, page 440) and then as the Setting Shaft 27082 rotates, the Cam 27090 rocks the Follower 27100 causing ear (h) to raise the Arm 37512, the nose of which contacts lip (i) rocking Fork 52455 rearward forcing the nose (f) of the Dog 52423 into the notch of the inner Disc 52444 where it is held by Pawl 52428. See Fig. 510 and Fig. 511.

15. The double Idler 52280 always rotates in the same direction as the Gear 32065. (See paragraph 10). The double Idler 52280 is used to drive the counter mechanism and the above drive relation is made use of in that drive. (See paragraph 2, page 449).

## CONTROL UNIT

Lever 37092 and Lever 37095 to rock downward about Stud 37053. Stud 37097, riveted to Link 37093 and passing through a slot in the Bar 37091, lowers the rear end of the bar in front of and into the path of the ear (k) of Lever 37475 and also in rear of and into the path of ear (l) of Lever 37450. Stud 37096, on Lever 37095, contacts and forces Lever 37265 to rock the Shaft 37261 and the forward end of Lever 37265 embracing Eccentric Stud 37083 causes Lever 37080 to rock forward about Stud 37084 and position its nose under ear (m) of Lever 37092. This action holds the add bar linkage depressed. Fig. 521.

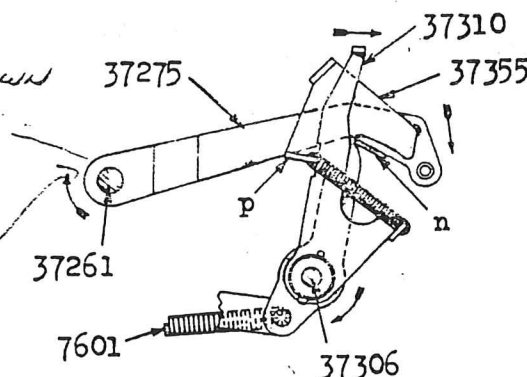


FIG. 522

2. When the add bar is depressed the machine is permitted to cycle once, transmitting the amount set up in the keyboard to the lower, or product carriage and restoring all depressed numerical keys to normal. Continuous addition, through holding down the add bar, cannot be obtained, as the machine is definitely limited to a single cycle of operation when this bar is used.

4. Both Lever 37265 and Lever 37275 are pinned to Shaft 37261, so that Lever 37275 is forced downward by the depression of the add bar and the shelf (n) is lowered thus releasing the Lever Assembly 37355, which is rocked rearward on Shaft 37306 by the Spring 7601. Ear (p) of the Lever Assembly 37355, contacts and forces Lever 37310, of Assembly 37305, to also rock rearward with Shaft 37261 to which it is pinned. Fig. 522.



# MARCHANT

## CONTROL UNIT . Cont'd

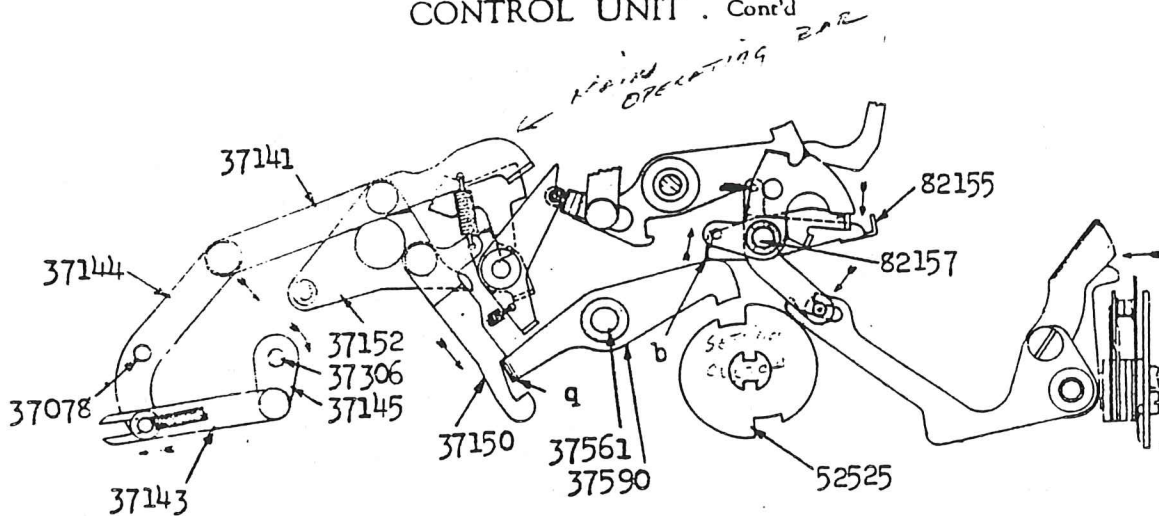


FIG. 523

5. Bar 37141 supported by parallel Links 37144 and 37152 pivoted on Studs 37078, is forced down and rearward by Shaft 37306 rocking the Lever 37145 which in turn forces Link 37143 forward to rock parallel Link 37144 about Stud 37078. Bar 37141 forces Link 37152 to rock down about Stud 37078 and the link forces Link 37150 to contact ear (q) of Setting Clutch Dog 37590 rocking the dog about Shaft 37561 which causes the nose of the dog to rise out of the notch in Setting Clutch 52525 thus allowing that clutch to operate. As the nose of the dog rises from the notch of the clutch it contacts ear (b) of Lever 82155 causing that lever to rock Shaft 82157 and close the starting switch. (See paragraph 5, page 428). Fig. 523.

6. The rotation of the motor is transmitted to the Setting Clutch 52525 (see 52000 SECTION, paragraph 4, page 431) rotating the clutch and Setting Shaft 27082 to which is attached a series of cams which thereupon carry out their respective functions (see 27000 SECTION, page 424). Among these cams is Starting

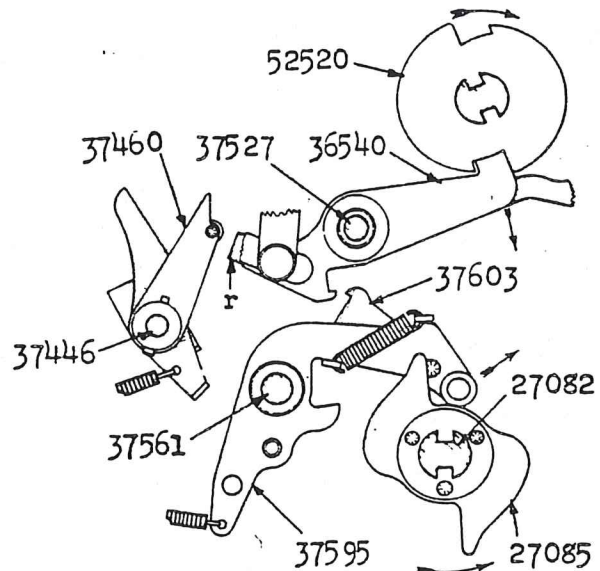


FIG. 524

Cam 27085 which rocks the Arm 37595 upward about the Shaft 37561 causing Lever 37603, a part of the Arm 37595, to engage and rock Dog 36540 down about Shaft 37527 thus withdrawing the dog from the notches of the Main Clutch 52520 thus allowing the clutch to rotate. Fig. 524.

7. If the previous operation of the machine involved the use of the add or multiplication bars, the position of the Reverse Clutch

# MARCHANT

## CONTROL UNIT . Cont'd

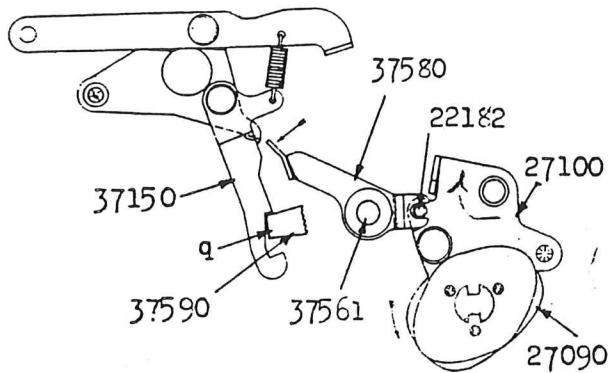


FIG. 525

52425 will not be affected and it will therefore continue to rotate with the main clutch in a positive direction. However, should a negative operation have preceded the add operation, the Reverse Setting Assembly 37495 will position the reverse clutch to positive through the action of the Cam 27090. (See 52000 SECTION, paragraph 13, page 434).

8. The Cam Follower 27100 which positions the reverse clutch also carries a Stud 22182 which is located in the fork of Lever 37580 and when the Cam 27090 actuates the Follower 27100 the Stud 22182 rocks the Lever 37580 about Shaft 37561 causing the forward end of the lever to rock the Link 37150

clear of the ear (q) of the Dog 37590 and thus permitting the nose of the dog to drop into the notch of the setting clutch thus limiting the setting shaft to one cycle. Fig. 525.

9. As the Setting Shaft 27082 rotates, the Cam 27088 forces the Cam Follower 37575 to rock about the Shaft 37561 pulling the Link 37493 down causing the Lever 37475 to rock about Shaft 37471. The ear (k) of the Lever 37475 contacts the rear end of Bar 37091 forcing that lever forward which in turn rocks the Clear Gate 87115 rearward about the Stud 12227 causing the Lock Bars 87030 to release all depressed numerical keys. Also in moving forward the Bar 37091 contacts the ear (l) of the Lever 37450 rocking that lever and the Shaft 37446 to which the lever is pinned. Fig. 526. Roller Latch 37460, being pinned to the Shaft 37446, is rocked forward clear of the ear (r) of the Dog 36540 and the nose of the dog pulls into the notch of the Main Clutch 52520 thus limiting the machine to one main clutch cycle in addition. See Fig. 524.

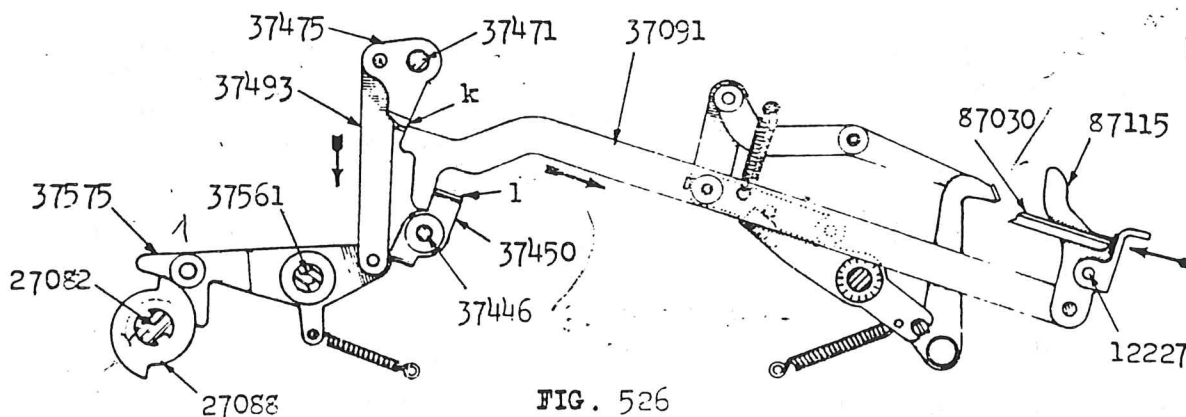


FIG. 526  
VIEW FROM LEFT



# MARCHANT

## CONTROL UNIT . Cont'd

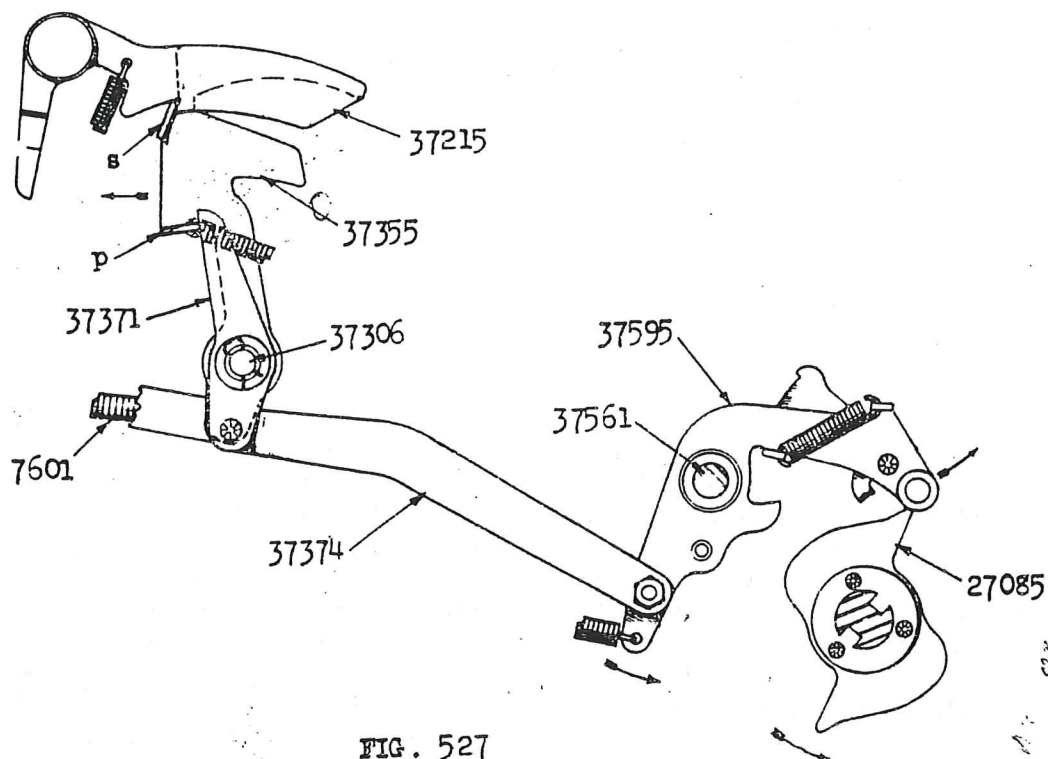


FIG. 527

10. The rocking upward of the Follower 37595 about the Shaft 37561 by the Cam 27085 as described in paragraph 6, page 436, pulls the Link 37374 rearward to rock the Lever 37371 about the Shaft 37306. The upper end of the lever contacts the ear (p) of the Lever Assembly 37355 forcing that assembly forward far enough to permit the Latch 37215 to drop over ear (s) of the assembly, thus preventing its return. This action tensions the Spring 7601 for future operation. Fig. 527.

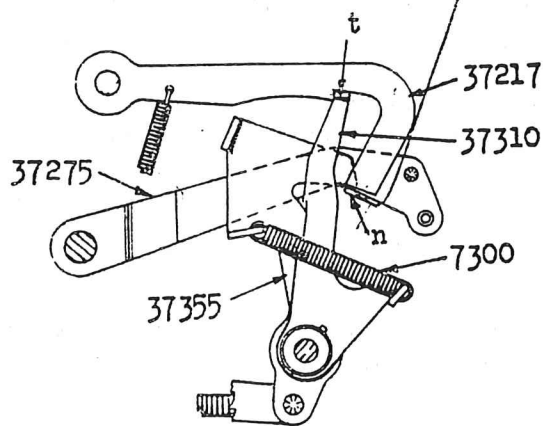


FIG. 528

11. As Lever 37355 is rocked forward Spring 7300 pulls forward on Lever 37310, but that lever is blocked from moving forward by the Latch 37217 which holds ear (t). Fig. 528.

# MARCHANT

## CONTROL UNIT . Cont'd

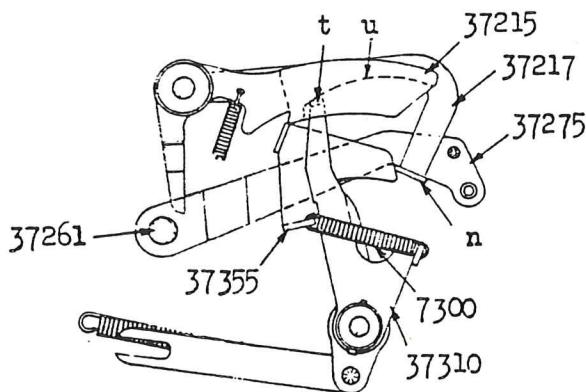


FIG. 529

12. When Lever 37355 is nearly cocked forward it releases shelf (n) of Lever 37275. (See Fig. 528). If by the time the operator has released the add bar, or as soon thereafter as he does release it, Lever 37275 is rocked to its upward position by Spring 7061 acting through Lever 37265 and Shaft 37261. (See Fig. 530). The upward movement of the shelf (n) raises Latch 37217 to release the ear (t) of Lever 37310 and this lever is pulled forward by Spring 7300. (See Fig. 528). Ear (t) of Lever 37310 underlies a curved cam member (u) welded to the back side of Latch 37215. Therefore this forward movement of Lever 37310 causes the ear (t) to cam Latch 37215 upward releasing Lever 37355 which moves rearward till blocked by edge of shelf (n) bringing these parts to normal position. Fig. 529.

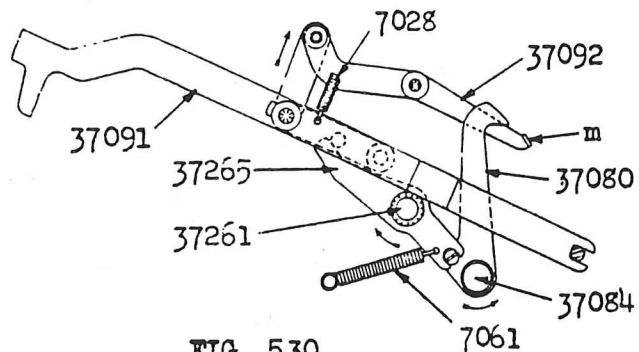


FIG. 530  
VIEW FROM LEFT

13. Lever 37275 and Lever 37265 are both pinned to Shaft 37261 and therefore act as a unit, so, as Lever 37275 is rocked upward Lever 37265 is also rocked and forces Lever 37080 to rock rearward about Stud 37084 causing the nose of that lever to move rearward from under the ear (m) of Lever 37092, thus permitting Spring 7028 to raise Bar 37091 and the add bar linkage to normal position. Fig. 530.

14. When Lever 37310 moves forward as described in paragraph 12, being pinned to Shaft 37306, it rocks that shaft, Lever 37145, and Link 37143 rearward. Spring 7404 rocks Lever 37144 about Stud 37078 forcing the Bar 37141 up and forward. This action in turn raises the Link 37150 and Spring 7150 pulls the lower end of Link 37150 rearward to engage the ear (q) of Dog 37590 in readiness for the next operation. Fig. 531.

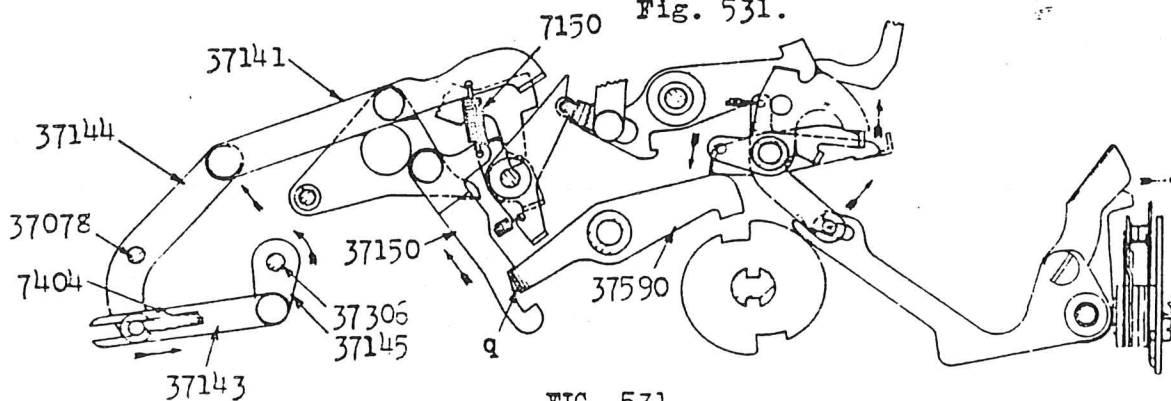


FIG. 531



# MARCHANT

## CONTROL UNIT . Cont'd

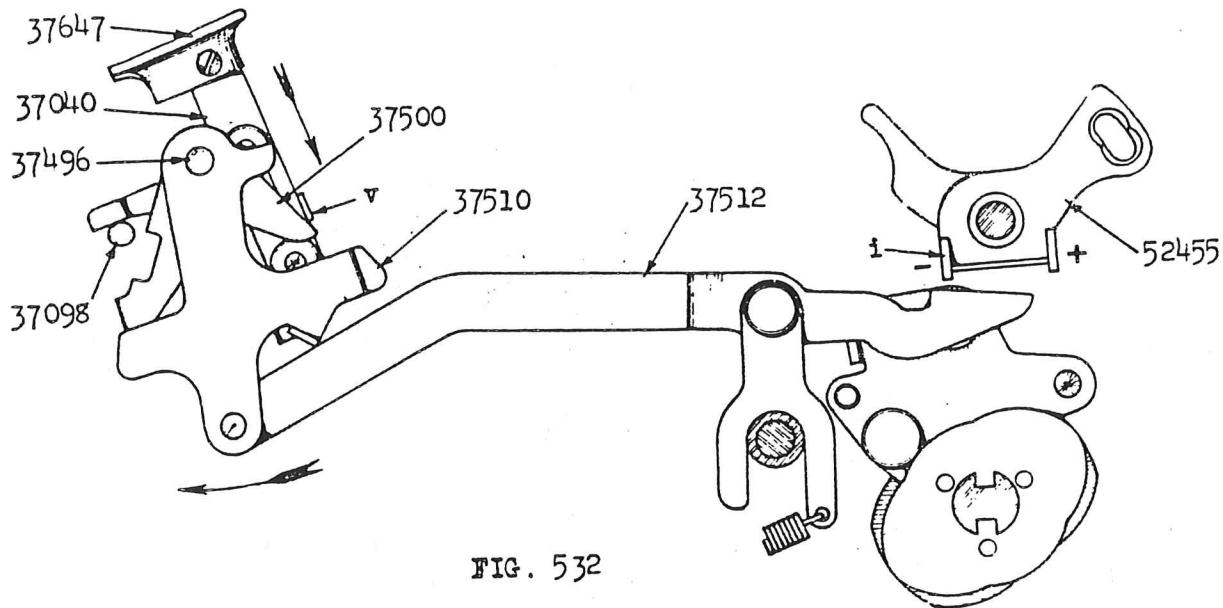


FIG. 532

15. The withdrawal of Dog 36540 from the main clutch allows it to rotate thus causing the Actuator and other related sections to function in accordance with the keyboard set up. When Main Clutch Dog 36540 drops into the clutch to stop its rotation it cams Arm 32315 of Assembly 32320 to release Latch 32306 from Centralizers 32300, permitting them to locate in the notches of Cam 32040. (See 32000 SECTION, paragraph 16, page 412). At the same time the extension at the rear of the dog trips and starts the restore clutch. (See 62000 SECTION, paragraph 4, page 446).

### The Subtract Bar 37647:

16. A depression of the Subtract Bar 37647 lowers Stud 37098 to initiate a main clutch cycle and key release operation in the same manner that the add bar does as described in paragraph 3, page 435. At the same time the ear (v) on Subtract Key 37040 contacts and rocks Lever 37500 forward causing Shaft 37496 to rock the Lever 37510 and Arm 37512, of the Assembly

37495, forward positioning the nose of Arm 37512 under the forward lip (1) of the Fork 52455 for a negative operation. (See 52000 SECTION, paragraph 14, page 434). This negative position is held until after the reverse clutch has been set by the interlock described in paragraph 3, page 473. This results in the actuator gears being turned in a negative direction. Otherwise the action of the subtract bar is identical with the add bar. Fig. 532.

### The Multiplication Bar 37646:

17. A depression of the multiplication bar causes the machine to cycle continuously, without releasing the depressed numerical keys, until pressure on the bar is removed thus resulting in a series of repeated additions of the amount set up on the keyboard. A depression of the Multiplication Bar 37646 forces Bar 37191, supported by the parallel Links 37037 pivoted on Studs 37179, downward to contact ear (w) of Lever 37275 thus rocking that lever downward. The shelf (n)

# MARCHANT

## CONTROL UNIT . Cont'd

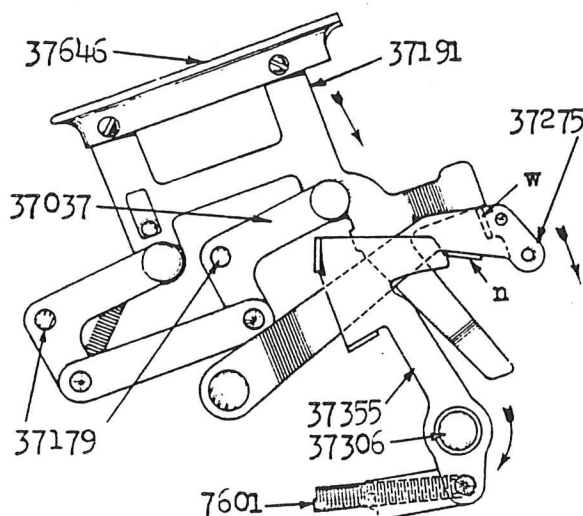


FIG. 533

of the Lever 37275 is lowered thus releasing the Lever Assembly 37355 which is rocked rearward about the Shaft 37306 by the Spring 7601, and carries with it the Lever 37310, of Assembly 37305, which in turn actuates the Bar-37141 to the rear and downward, the machine functioning as described under the Add Bar, paragraph 4, page 435. Fig. 533.

18. As the Bar 37091 is not lowered as in addition, ear (k) of Lever 37475 does not contact it and the keyboard set up is not disturbed. Neither does the Bar 37091 contact ear (l) of the Lever 37450 so the Roller Latch 37460 is not forced

away from contact with the Main Clutch Dog 36540. See Fig. 526. When the Bar 37141 is rocked down and rearward the Lever 37455 follows the ear (x) of the Bar 37141, allowing the Roller Latch 37460 to be pulled under ear (r) of the Dog 36540 by the Spring 7328. The main clutch then rotates until such time as the roller latch is retracted from beneath the ear (r). Fig. 534.

19. The Bar 37512 is normally spring-urged to position its nose beneath the lip (g) of Fork 52455 for a plus operation (see 52000 SECTION, paragraph 13, page 434) but should the mechanism be slightly sluggish, the downward movement of ear (y) of Multiply Bar 37191 will rock the Lever 37510 about Shaft 37496 causing the Bar 37512 to move rearward to the plus position. Fig. 535.

20. The recocking action is the same as described under addition; paragraphs 10 to 14, inclusive, page 438. As the Bar 37141 is restored forward and upward, the ear (x) contacts the Lever 37455 rocking it forward and causing the Shaft 37466

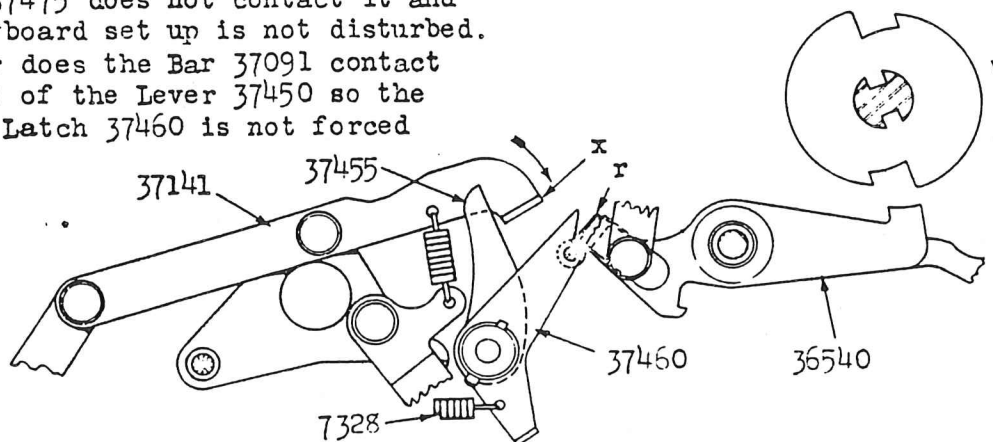


FIG. 534



# MARCHANT

CONTROL UNIT . Cont'd

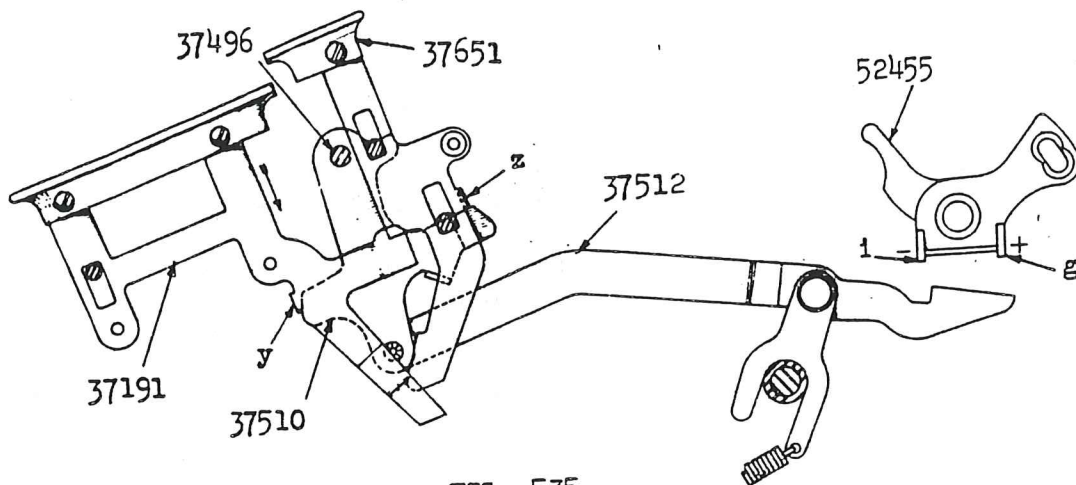


FIG. 535

to rock the Roller Latch 37460 out from under the ear (r) of the Dog 36540 which then engages in the notch of the main clutch and stops it. Fig. 536.

The Short Cut Bar 37651:

21. The short cut bar is provided to enable the operator to make a series of continuous subtractions and it functions in the same manner as the multiplication bar. A depression of the Bar 37651 forces the ear (z) of the Stem 37210 to contact the Lever 37510 rocking that lever and Bar 37512 forward, positioning the nose of the Bar 37512 under the forward lip (1)

of the Fork 52455 for minus operation. (See 52000 SECTION, paragraph 14, page 434). The Stem 37210 also contacts the ear (w) of the Lever 37275 rocking that lever down so that shelf (n) releases the Lever Assembly 37355 starting the machine as described under multiplication, paragraph 18, page 441. From this point the sequence of movement continues as in multiplication with the exception that Cam Follower 27100 positions the dog of the reverse clutch to its negative setting, as in subtraction,

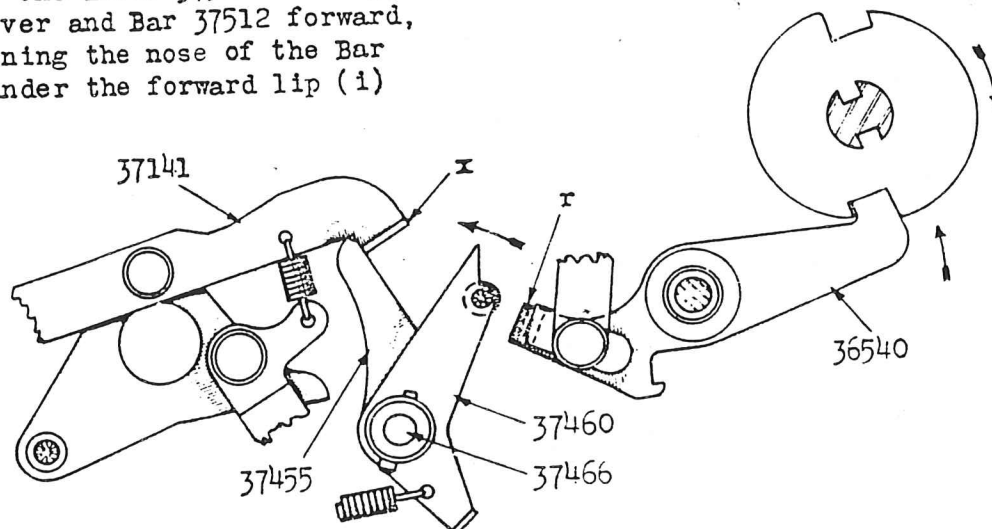


FIG. 536

# MARCHANT

## CONTROL UNIT Cont'd

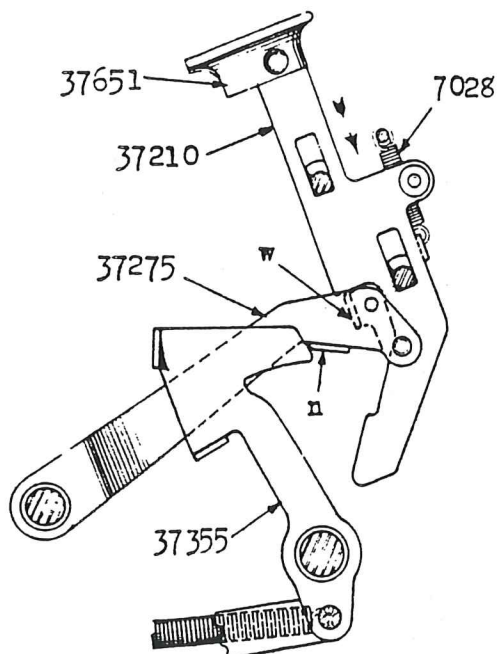


FIG. 537

with the result that the actuator gears rotate in a negative direction. Removal of pressure from the short cut bar permits the Spring 7028 to restore it to normal, and to trip the Roller Latch 37460 out from under the Dog 36540 so as to stop the main clutch. (See paragraph 20, page 441). Fig. 537.

The Stop Key 37649:

22. The primary purpose of the stop key is to stop the machine when dividing (see DIVISION, paragraph 43, page 471) but it is

also used to restore other control keys to normal after they have been depressed with the motor off or, without properly operating the machine. If, however, the division key has been depressed under these conditions, the ear of the Lever 37404 must be pushed to the rear through the long slot in the bottom cover as well as depressing the stop key. Upon depression of the Stop Key 37649 the ear (A) of the Stem 37201 forces the Lever 37205 to pivot about Stud 37182 rocking the Lever 37290 about the Shaft 37261. If the Lever Assembly 37355 is in its rearward position overlying shelf (n), the rocking of Lever 37290 will force Link 37143 rearward thus rocking Lever Assembly 37355 forward about the Shaft 37306 until the shelf (n) of the Lever 37275 rises to normal position in rear of the Assembly 37355. When the Lever 37275 rises it actuates the Interlock 37213 allowing the short cut bar to return to normal

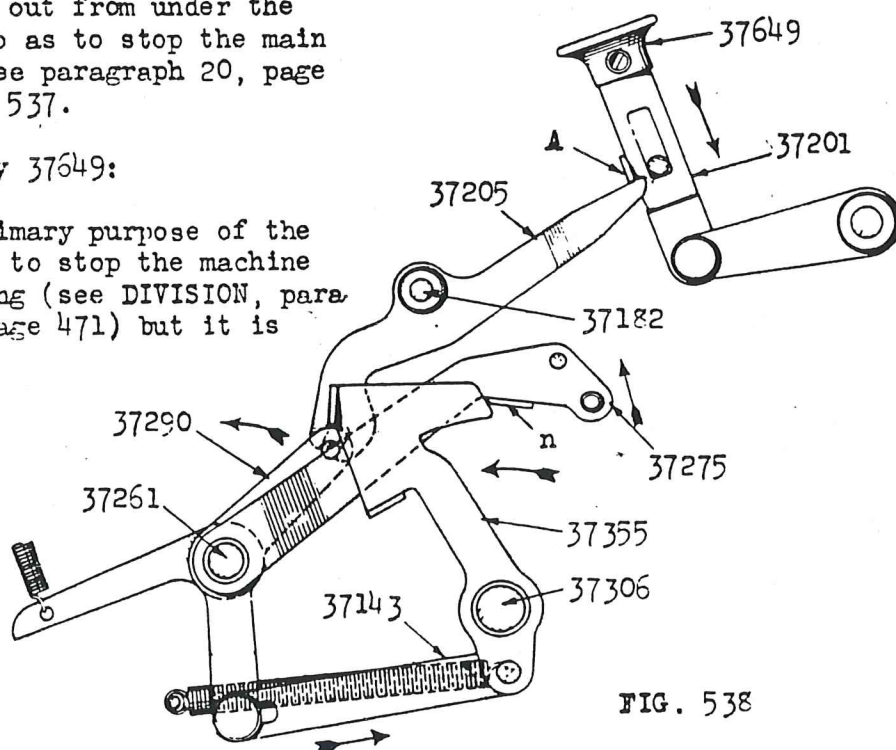


FIG. 538



# MARCHANT

## CONTROL UNIT . Cont'd

if depressed. Although the Main Operating Bar 37141 is also restored to normal position at the same time by the Spring 7404 (see Fig. 531, page 439), a setting cycle cannot be prevented as the Dog 37590 has been withdrawn from the setting clutch, and the roller retainer has been spring advanced under the dog thus preventing its return. Fig. 538.

23. The mechanism and operations controlled by the various keys as listed below, will be fully explained in other sections and so will not be described at this time.

Division Key 37648:

See Automatic Division, page 455.

Clear Keys 37642 and 37643:

See 57000 SECTION, Power Clearance, page 421.

Keyboard Dial Key 37641:

See 87000 SECTION, Keyboard, page 403.

Shift Bars 72013:

See 72000 SECTION, Carriage Shift, page 452.

Counter Reverse Lever 67011:

See 67000 SECTION, Counter Mechanism, page 449.

# MARCHANT

## RESTORE MECHANISM

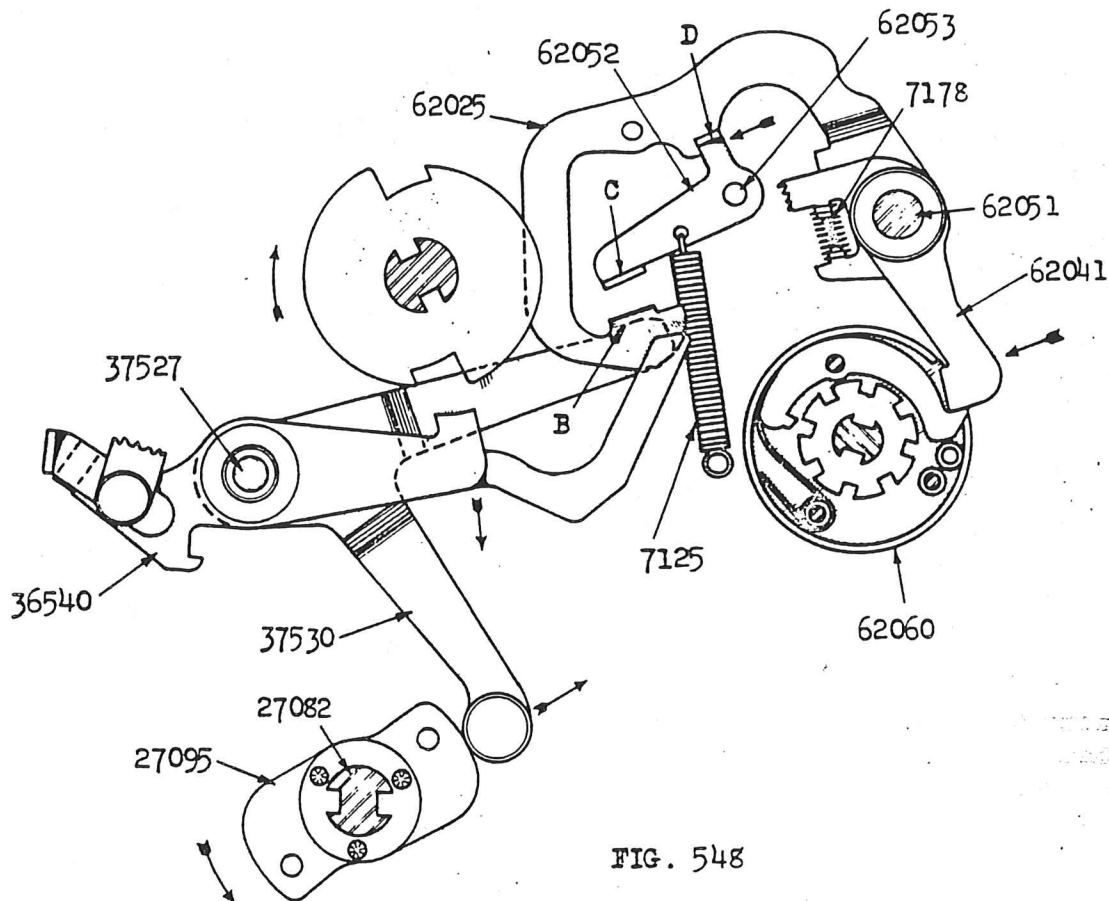


FIG. 548

1. At the completion of each calculating operation the restore clutch is required to function in order to return the various parts of the machine to a normal position. This operation is in each case the same except that in division, although the functioning of the clutch is identical with that during other operations, certain different parts are in a position to be operated by it, and at times the control of the restore stroke is slightly different. (See DIVISION, paragraph 23, page 462).

2. As the Setting Shaft 27082 rotates resulting from the depression of a control key, the Cam 27095 actuates the Follower 37530 rocking it upward about the Shaft 37527 to contact the

ear (B) and thus raise the Arm 62025 about the Shaft 62051. The Arm 62025 is connected to the Dog 62041 by the Spring 7178 so that it may be raised even though the Restore Clutch 62060 is still operating at the completion of a previous operation. The release of the Dog 36540 from the main clutch, occurring at the same time that the Arm 62025 is being raised, lowers the extension on the rear of the dog from the ear (C) on the Latch 62052 permitting the latch to be rocked about Stud 62053 by the Spring 7125 and position the ear (D) of the latch under the step on the Lever 62025. The Lever 62025 acts through the compression Spring 7178 to hold the Dog 62041 into engagement with the Clutch 62060 and thus prevents rotation of the clutch. Fig. 548.



# MARCHANT

## RESTORE MECHANISM . Cont'd

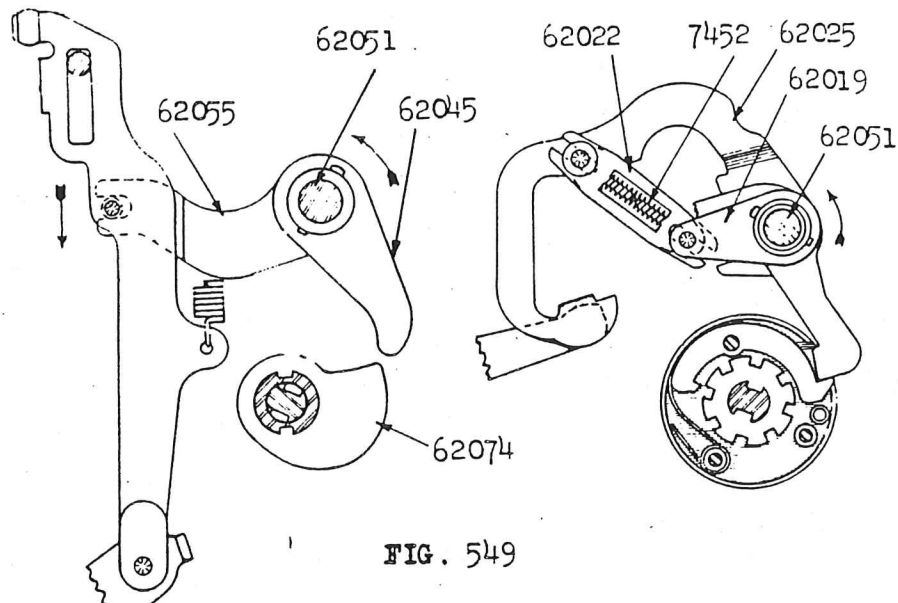


FIG. 549

3. Lever 62055, Lever 62045, and Lever 62019 are all pinned to the Shaft 62051. As the carriage is lowered by the setting line, Lever 62055 rocks Shaft 62051 thus positioning the nose of Lever 62045 above the high point of Carriage Rise Control Cam 62074 and also rocking the Lever 62019 downward. Lever 62019 is connected to the Arm 62025 by means of a yieldable link consisting of two Plates 62022 and Spring 7452. This link is so constructed that the Spring 7452 is directly effective to return it to its original length if it is either extended or compressed therefrom. Therefore when the Lever 62019 is rocked down by the dipping of the carriage it causes the yieldable link to pull down on the Arm 62025. Fig. 549.

4. At the completion of the main clutch cycle when the Dog 36540 engages the main clutch, the extension on the dog contacts the ear (C) and rocks Latch 62052 about Stud 62053 so ear (D) is rocked from under the step on Arm 62025 which is forced downward about the Shaft 62051 by Spring 7452 of the

yieldable link. Nose (E) on Lever 62025 contacts the forward extension on Release Dog 62041 rocking the dog about Shaft 62051 and out from Restore Clutch 62060. Clutch Dog 62061A is then rocked about Stud 60038 by Spring 7369 into engagement with Disc 62062 and as Gear 62081 is constantly rotating the Shaft 62077 and Disc 62062, the Clutch 62060 is rotated. The forward end of Dog 62041 contacts ear (d) of Switch Control Assembly 82150 rocking it down to close the Switch 82130 and start the motor. (See paragraph 5, page 428). Fig. 550.

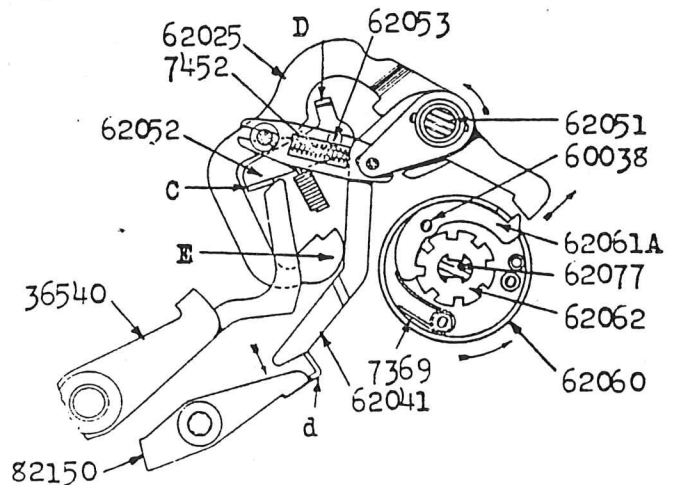


FIG. 550

# MARCHANT

## RESTORE MECHANISM . Cont'd

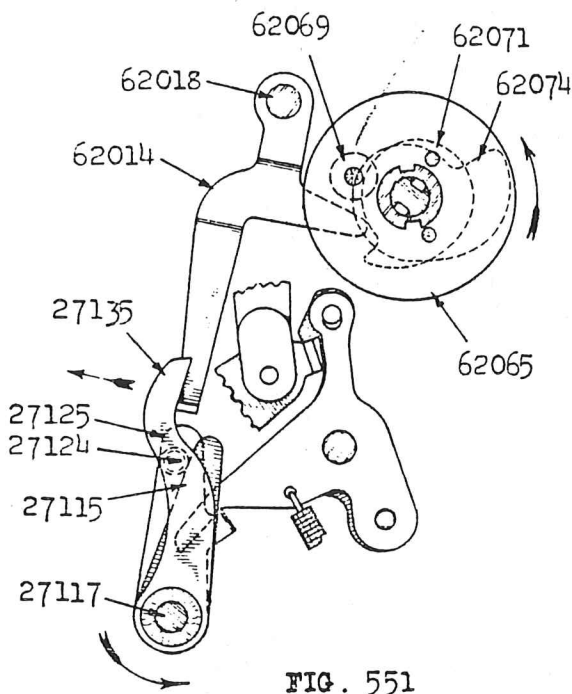


FIG. 551

5. Included in the Restore Clutch Assembly 62060 are the Division Restore Cam 62071, the Carriage Unlatching Assembly 62065, and the Carriage Rise Control Cam 62074. As the restore clutch rotates, the Roller 62069 of the Assembly 62065 rocks the Lever 62014 forward about the Stud 62018 to contact the Lever 27135 and rock it and Lever 27115 which are both pinned to the Shaft 27117. Fig. 551.

6. Lever 27115 contacts the Stud 27124 on Arm 27125 thus rocking that arm forward together with the Shaft 27127 and Lever 27131. It will be noted that Shafts 27117 and 27127 are in line but not connected together. The rocking of Lever 27131 restores released Pivot Pawls 32202 as described in 32000 SECTION, paragraph 15, page 412. Ears (F) on Levers 27125 and 27131 contact and rock the two Latches 27106 about Studs 12221 to release ears (L) on Carriage Positioning Levers 27145

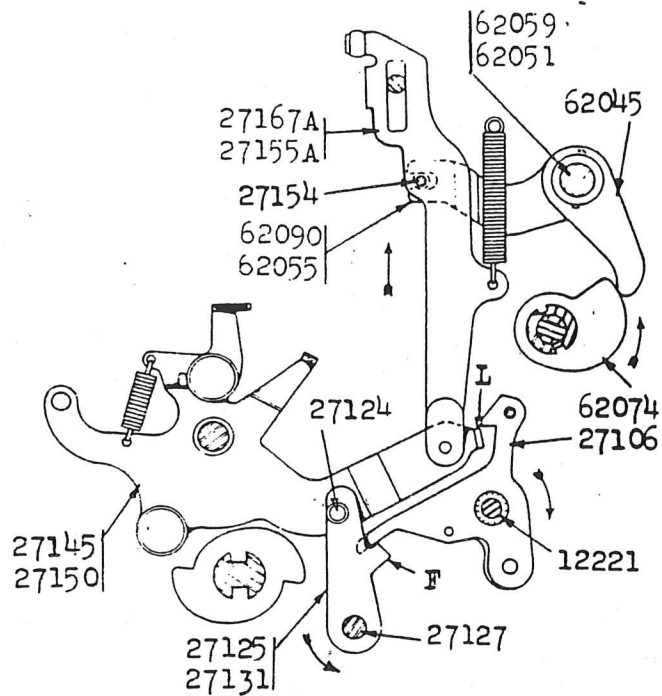


FIG. 552

and 27150, thus permitting Springs 7478 in the carriage to raise the carriage. In order that the carriage may be controlled to a smooth and uniform rise an Arm 62045 is provided whose movement is controlled by Cam 62074, which is keyed to Restore Clutch Assembly 62060, so as to turn with it. As the restore clutch starts to revolve, the high point of Cam 62074 moves in under Arm 62045 preventing its return, except at the rate permitted by the gradual slope of the cam, as the cam is advanced by the restore clutch. Shafts 62051 and 62059 are pinned together, and as Arm 62045 is pinned to the Shaft 62051, and Levers 62055 and 62090 are pinned to the Shaft 62059, all three levers are controlled by Cam 62074. Levers 62055 and 62090 have a fork on their forward end which embraces Studs 27154 on Links 27155A and 27167A, thus controlling the rise of these links, which in turn control the carriage rise. Fig. 552.



# MARCHANT

## RESTORE MECHANISM . Cont'd

7. The rotation of the Cam 62071 rocks the Division Restore Assembly 37415, an operation fully described under DIVISION, paragraph 24, page 463.

8. As the Arm 62045 follows the Cam 62074, the Lever 62019 which is also pinned to the Shaft 62051, presses the Lever 62025 upward by means of the Spring 7452 in the two-way yieldable link previously described, thereby withdrawing the nose (E) from the forward arm of the Dog 62041. This permits the

Spring 7178, acting between Lever 62025 and Dog 62041, to force the nose of the dog to ride on the housing of the restore clutch and when the dog reaches the cut-out in the housing it is also forced by the same spring action to contact and release the Dog 60061A from the Disc 62062 thus stopping the rotation of the restore clutch. When the Dog 62041 drops into the notch of the clutch its forward end rises allowing Assembly 82150 to open Switch 82130 and stop the motor. See Fig. 550, page 446.

# MARCHANT

## COUNTER MECHANISM

1. This mechanism is used to count the number of main clutch cycles and register the same in the upper carriage dials. With the Lever 67011 set in its upper position (as shown in Fig. 565), a direct count is obtained of both multipliers and quotients; the register then being adapted to always count positive cycles and subtract negative cycles, except during automatic division when it automatically changes to counting negative cycles and subtracting positive cycles. With the Lever 67011 in its lower position complementary count of both multipliers and quotients is obtained. With this setting negative cycles are always counted and positive cycles subtracted, except during automatic division, when positive cycles are counted and negative cycles subtracted. All the usual run of calculating work can therefore be carried on with the lever in its upper position and it need only be brought into its lower position when it is desired to register a negative multiplier or the complement of a quotient.

### Counter Drive Train:

2. As has been indicated under 52000 SECTION, REVERSE CLUTCH, paragraph 10, page 432, the double Idler 52280 is geared directly into the small Gear 52441 of the reverse clutch assembly. Gear 52441 is keyed to the large Gear 52446 which is geared directly into Gear 32065 on the One-Half Turn Shaft 32070 of the Actuator Unit. Thus Gears 52441 and 52446 act as a compound idler connecting the double Idler 52280 to the One-Half Turn Shaft 32070, causing it to always turn in the same direction

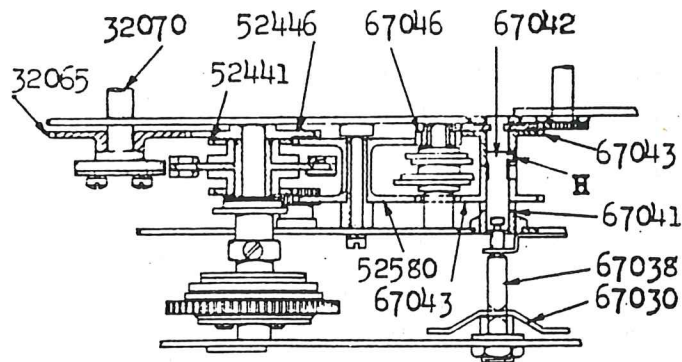


FIG. 562

as the one-half turn shaft, which is top rearward for positive operation and forward for negative. The right hand gear of the double Idler 52280 is geared directly into the outer Counter Gear 67043 while the inner gear of the double Idler 52280 is geared through idler Pinion 67046 to the inner Gear 67043. Hence, the inner Counter Gear 67043 will always rotate in the same direction as the double Idler 52280 and the actuator one-half turn shaft, which is top rearward for positive operation and the outer Gear 67043 will rotate in the opposite direction. Fig. 562.

### Counting Finger Operation:

3. Idler 92321 in the order of the Counting Register which is standing in line with the first key section is operated by Counting Finger 67061 which is actuated by Link 67063 by means of Eccentric 67057 pinned to the end of Shaft 67056, the opposite end of which is integral with a gear (G) meshing with the Counter Drive Gear 67044 which is keyed to the Counter Reverse Shaft 67041. The movement which the Eccentric 67057 gives to the Counting Finger 67061 is so altered by the shapes of the guide slots in Link 67063, and in the finger, that the tip of the counting finger acts to drive the Idler 92321 its full step and then



# MARCHANT

## COUNTER MECHANISM . Cont'd

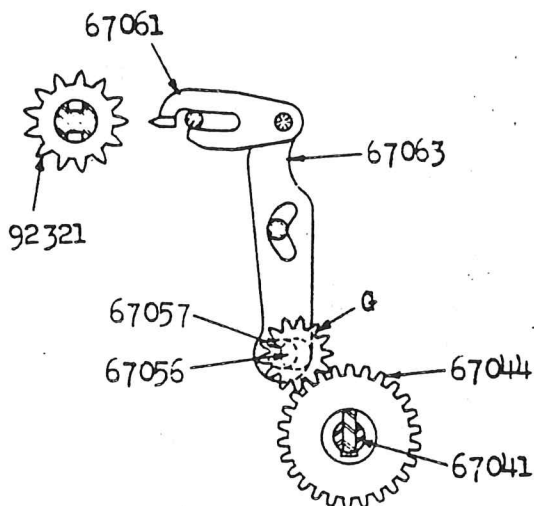


FIG. 563

it returns a slight distance to check the movement of the idler before it withdraws, thus preventing overthrow regardless of speed. Fig. 563. The Eccentric 67057 also has a centralizing cam integral with it against which Counter Centralizer 67059 is pressed by Spring 7278 so as to bring the parts into their normal position in which Counting Finger 67061 is held away from Gear 92321. Fig. 564.

4. Sliding in the central slot of Shaft 67041 is Key 67042 having a projecting tip (H) adapted to enter into the slot in either of the two Counter Gears 67043, thereby keying the shaft to one or the other of these two counter gears. Thus the Key 67042 may be slid in or out so as to take the counter drive off of either one of the two Gears 67043. For this purpose Shift Pin 67038 locks into Key 67042 in such a manner as to leave the key free to rotate but controlled in endwise position by the shift pin which is in turn positioned by Cam 67030 the upper surface of which enters into a slot in Shift Pin 67038. See Fig. 562.

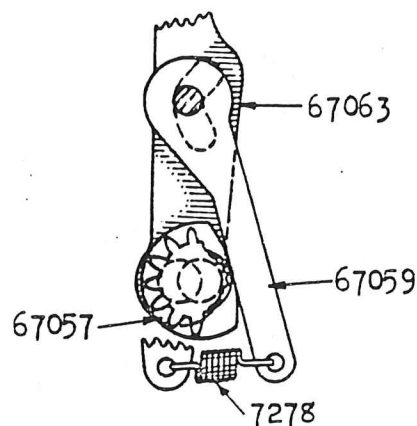


FIG. 564

5. The directions of rotation are such that when Shift Pin 67038 is shifted to the right thereby keying the counter drive to the outer Gear 67043, the counting finger is operated in the direction adapted to make a positive count of plus strokes, and a negative count of minus strokes; whereas when it is shifted in to the left so as to key inner Gear 67043 to Shaft 67041, the counting finger operates in the direction adapted to give a positive count of minus strokes and a negative count of plus strokes. Cam 67030 is so formed that when it is rocked forward or back into either of its extreme positions it cams Shift Pin 67038 out to the right to give a positive count of plus strokes; whereas when it is in its middle position it cams Shift Pin 67038 over to the left so as to give a positive count of minus strokes.

### Counter Reverse Control:

6. Cam 67030 is positioned by Link 67014 acting through connecting Link 67026. The upper end of Link 67014 is positioned by the Lever 67011 and Link 67018 so as

# MARCHANT

## COUNTER MECHANISM . Cont'd

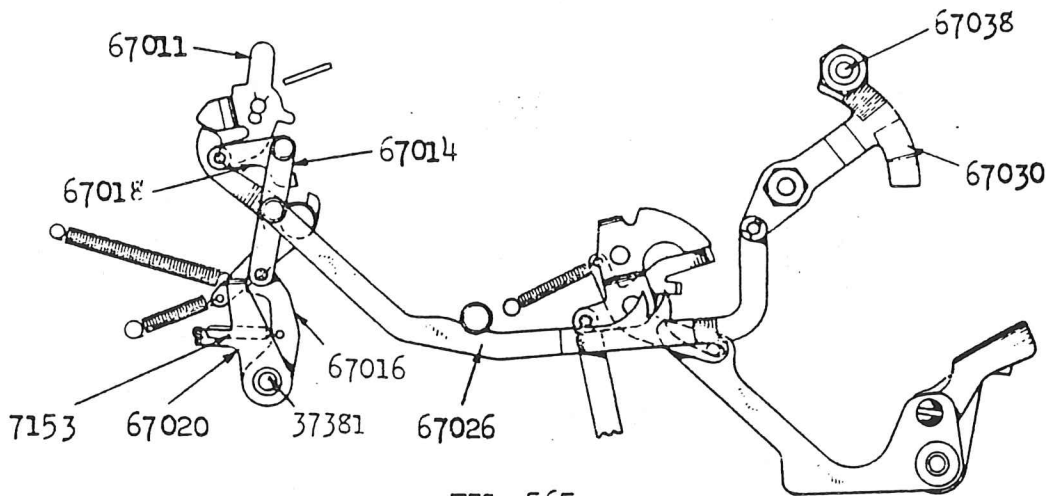


FIG. 565

to be in a forward position when Lever 67011 is set in its upper position for direct count, and in a rearward position when Lever 67011 is set in its lower position for complementary count. The lower end of Lever 67014 is positioned by the Lever 67016 which is moved into a rearward position by Lever 67020 when the division key is depressed and returned to a forward position by Spring 7153 when the division key is raised. (Division Key 37110 rocks the Shaft 37381 along with Lever 37119 and Lever 67020, which are pinned to it by means of Lever 37116 and Link 37117. See Fig. 590). Therefore, the midpoint of the Link 67014, to which point Link 67026 is attached, will be in its furthest forward position when Lever 67011 is set for a direct count and the division key is up, because both the upper and lower ends of Link 67014 will then be in their forward position. Similarly, the midpoint of Link 67014 will be in its furthest rear position when Lever 67011 is set for complementary count and the division key is depressed; because both the upper and lower ends of Link 67014 will then be moved to the

rear. Therefore, when the machine is set either for direct multiplication or complementary division, Cam 67030 will be rocked into one of its extreme positions which will, as previously noted, (paragraph 5, page 450), cam Shift Pin 67038 to the right and condition the counter for counting plus strokes. Fig. 565.

7. However, for direct division the upper end of Link 67014 will be positioned forward and the lower end thereof in its rear position leaving the point of attachment of the Link 67026 approximately central of its range of movement. Similarly if set for complementary multiplication, the upper end of Link 67014 will be moved to the rear while the lower end of it will be in its forward position, again leaving the point of attachment of the Link 67026 approximately central of its range of movement. Therefore Cam 67030 will be brought to a central position for direct division and also for complementary multiplication which as previously described, (paragraph 5, page 450), will cam Shift Pin 67038 to the left and will condition the counter for counting minus strokes. See Fig. 565.



# CARRIAGE SHIFT

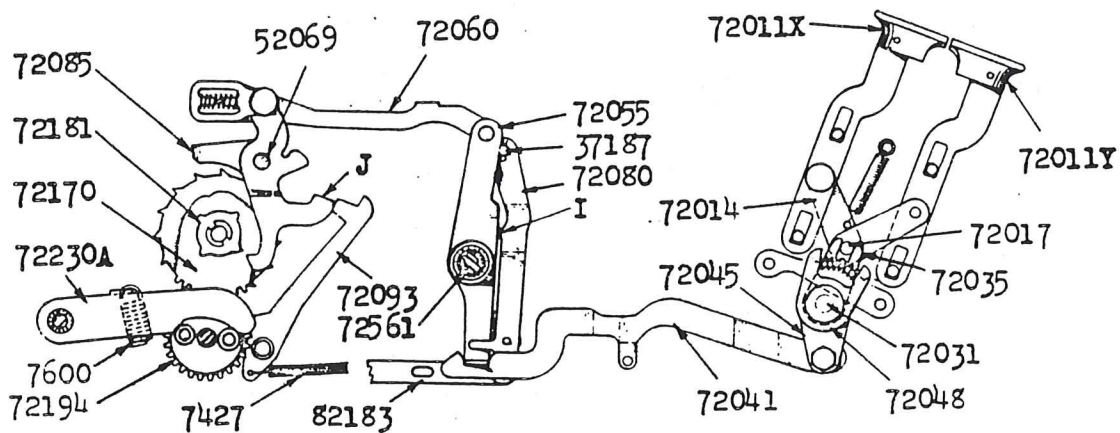


FIG. 575  
VIEW FROM LEFT

1. In order to shift the carriage one column at a time in either direction, two Keys 72011X and 72011Y are provided. A depression of the upper Key 72011X shifts the carriage to the left while a depression of the lower Key 72011Y shifts it to the right. Fig. 575. Shift Drive Assembly 72130 derives its rotation from the 52000 SECTION being connected to the Gear 52260 by the Coupling 52263 and rotating constantly to the rear. Unless a shift key is depressed the Centralizer 72230A holds the Gear 72194 from turning, thus holding the compound Gear 72170, with which it meshes, from turning and permitting the balance of the shift planetary mechanism to idle. With the Gear 72194 stationary no shift occurs. See Fig. 576.

Shift to Left:

2. When upper Shift Key 72011X is depressed Link 72014 forces Stud 72017 to rock Fork 72035 forward, thereby rocking Shaft 72031 and Lever 72048. The Lever 72045, which is spring-connected to Lever 72048 to prevent the operator straining the interlock mechanism, rocks Link 72041 rearward causing

Lever 72055 to rock about Shaft 37561 and thus move the upper end of that lever forward. Lever 72055 contacts the ear (I) on Centralizer 72080 moving it forward about Stud 37187 thereby pulling Links 82183 forward. (See Fig. 575). The pull on Link 82183 closes Switch 82130 and starts the motor, as described in paragraph 5, page 428. (See Fig. 494). The Lever 72055 pulls the Link 72060 forward and through a spring-connection rocks the Bell Crank 72085 about Stud 52069 to engage Ratchet 72181. Bell Crank 72085 is held in an operative position by the nose of the Pawl 72093, pressing on the top side of ear (J) of the bell crank, under tension of Spring 7427. The rotation of the Ratchet 72181, being blocked by the Bell Crank 72085, the Sun Gear 72175 keyed to the Ratchet 72181 is also held stationary while the ring gear of Assembly 72130 feeds the Planetary Gears 72167 to the rear about it. This forces small Planetary Gears 72166, each of which is integral with one of the large Planetary Gears 72167, to drive the Gear 72170 to the rear, and compound Gear 72170 in turn drives the Gear 72194 forward. Gear 72194 is located between Disc 72220A and Friction Disc 72193 keyed to Jack

# MARCHANT

## CARRIAGE SHIFT Cont'd

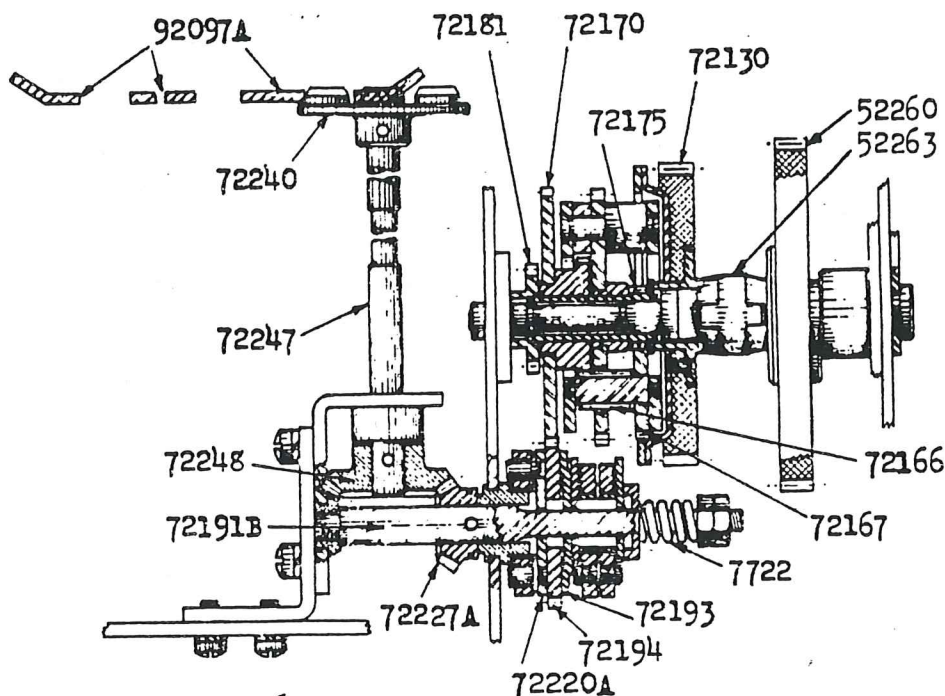


FIG. 576

Shaft 72191B and clamped by pressure of Spring 7722. Thus the Jack Shaft 72191B is driven by Gear 72194 through a friction clutch which eliminates any possibility of stalling or locking the machine should the carriage fail to shift due to meeting some unusual resistance or interference. Fig. 576.

3. The Shaft 72191B rotates one-half turn per shift cycle, and turns the vertical Shaft 72247 one-third turn per cycle by means of Bevel Gears 72227A and 72248. On the upper end of the vertical shaft is a plate and roller Assembly 72240 the rollers of which engage with the Carriage Rack 92097A and cause it to move one column to the left for each one-third of a turn. Fig. 577. On each end of this rack the lugs are turned up in such a way that if an attempt is made to shift the carriage beyond its end position the rollers on Assembly 72240 cam the rack up out of the

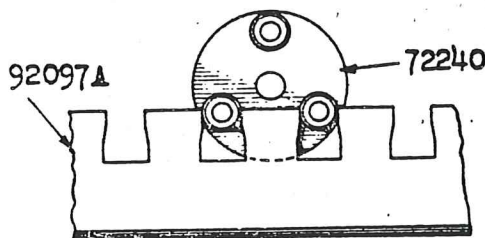


FIG. 577

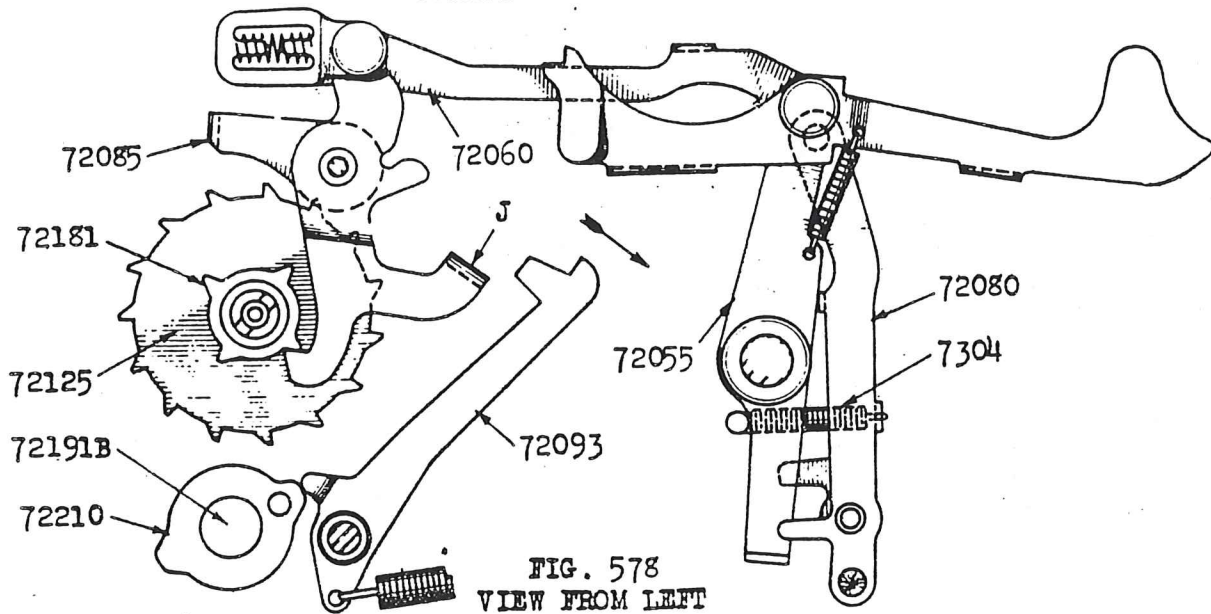
way, and permit the roller assembly to turn freely without shifting the carriage. (See Fig. 576).

4. Cam 72210 is arranged to have a certain amount of free float with respect to the Jack Shaft 72191B on which it is mounted, so that whichever way the shaft is turning the cam will lag back to such an extent that shortly before the jack shaft has completed one-half a revolution Cam 72210 rocks Pawl 72093 forward from Bell Crank 72035 thus freeing it so it can be centralized. If at this time the operator has released the shift key, Centralizer 72080



# MARCHANT

## CARRIAGE SHIFT . Cont'd



tensioned by Spring 7304 returns Lever 72055 to its central position, thereby through Link 72060 returning Bell Crank 72085 to its neutral position, thus releasing Ratchet 72181 and permitting Assembly 72125 to idle. Fig. 578. Centralizer 72230A, under tension of Spring 7600 presses against the rollers of the Assembly 72220A to insure a full cycle of Jack Shaft 72191B and a proper positioning of the carriage. See Fig. 576. The centralizing of Shift Centralizer 72080 opens the starting switch to stop the motor.

5. If at the time Cam 72210 cams Pawl 72093 clear of ear (J) of Bell Crank 72085 (Fig. 578) the operator has not released the shift key, the Centralizer 72080 cannot bring the Lever 72055 and Bell Crank 72085 to their central positions, and therefore as soon as the rise on Cam 72210 passes clear of Pawl 72093 the pawl drops back into position over ear (J) of the Bell Crank 72085 thus insuring another complete cycle. Only when Cam 72210 rocks Pawl 72093 at a time when the shift key has been released will the sequence of shift cycles be terminated.

### Shift to Right:

6. The principle is the same for a shift to the right as for a shift to the left. When lower Shift Key 72011Y is depressed Link 72012 forces Stud 72017 to rock Fork 72035 rearward, thereby rocking Lever 72048 and Lever 72045, pulling Link 72041 forward and causing Lever 72055 to rock about Shaft 37561 and thus move the upper end of that lever rearward. (See Fig. 575). Ratchet 72125 being thus held by the bell crank holds fixed the centers of Planetary Gears 72166 and 72167. Therefore, when the ring gear of the Assembly 72130 rotates Planetary Gear 72167, top rearward, Planetary Gears 72166 drive Gear 72170 forward turning Gear 72194 and Jack Shaft 72191B backward. The jack shaft turns Bevel Gear 72227A backward and through the mechanism previously described the carriage is shifted to the right. (See Fig. 576). Pawl 72093 is released and the motor is stopped as described under "Shift to the Left."

Automatic Shift (to left): See Division, paragraph 33, page 467.

# MARCHANT

## AUTOMATIC DIVISION

### Automatic Division:

1. Before proceeding with a mechanical description of the functions of the machine during division, a general outline of the theory involved will be given. This will result in a clearer conception of the reasons for certain operations, thus making it easier to follow the mechanical sequences required to produce those results. Furthermore instead of presenting a description of the various steps a concrete example will be given which will include every phase in such a manner as to be easily understood.

2. Division consists of a series of subtractions in which the divisor (set up in the keyboard) is subtracted as many times as possible from the dividend (set up in the middle dials), the number of these subtractions appearing in the upper dials as the quotient. In cases where a remainder is involved that figure is automatically multiplied by ten (by means of the carriage automatically shifting one column to the left) and the process continued until the problem is completed.

### EXAMPLE:

3. Operate the machine slowly by hand in order that the different steps may be followed:

$$21 \div 5 = 4.20$$

Set the lower carriage in Position 4 (that is with the 4th carriage dial in line with 1st key section). By means of an add operation set 21 in the 4th and 5th middle dials. Clear the upper dials. (This can most easily be done by depressing the Subtract Bar). Set 5 in the first key section which will be directly be-

neath the figure "1" in the middle dials. Depress the division key and operate the machine.

```

21
-5
16 1st cycle - "1" in upper dials
-5
11 2nd cycle - "2" in upper dials
-5
6 3rd cycle - "3" in upper dials
-5
1 4th cycle - "4" in upper dials
    
```

The remainder (1) being less than the divisor (5) the carriage shifts one column to the left and division continues

```

10
-5
5 1st cycle - "4.1" in upper dials
-5
0 2nd cycle - "4.2" in upper dials
    
```

The carriage again shifts one column to the left and division is completed; however, the machine will continue to operate in division until the carriage has shifted to its extreme left position or is stopped manually which action will be explained later.

```

      00
      -5
9.....995 1st cycle - "4.21" in
              +5      upper dials
0.....00 2nd cycle - "4.2" in
              upper dials
    
```

It will be observed that in the last position the machine has made an overdraft, that is, it subtracted once too many times. The mechanism is so designed that when an over-draft occurs the machine will make one corrective plus cycle and then shift. If the remainder is less than about one-half of the divisor no overdraft will be made, but if the



# MARCHANT

## AUTOMATIC DIVISION . Cont'd

remainder is larger an overdraft will occur.

4. The principle of division control is the comparison of the remainder in the middle dials with the divisor in the keyboard. The division stop mechanism is, in general controlled by the column in line with the left hand digit of the divisor and frequently during the early stages of the operation in each carriage position by the one or two orders to the left thereof. When the remainder is reduced to about one-half as great as the divisor the division control mechanism is released and upon completion of the machine cycle then in progress the subtraction is stopped, a plus stroke taken in case the machine has overdrafted, and the carriage shifted one column to the left to continue the operation. In the example  $21 \div 5$  the machine will operate through several cycles until the "2" in the middle dial has been reduced to a point about one-half way between "1" and "0" whereupon control will be transferred to the next column to the right and the operation will continue until the remainder in the units column has been reduced to about one-half of "5". Division will stop, the carriage will shift and division will continue until the last position is reached. (The control operations will occur with slightly larger figures showing in the case of hand operation than under power).

5. To provide for conditions where the control is transferred from column to column as in the last problem, the Division Gate 22200 is constructed with a series of steps, one for each column and each step being .015" shorter than

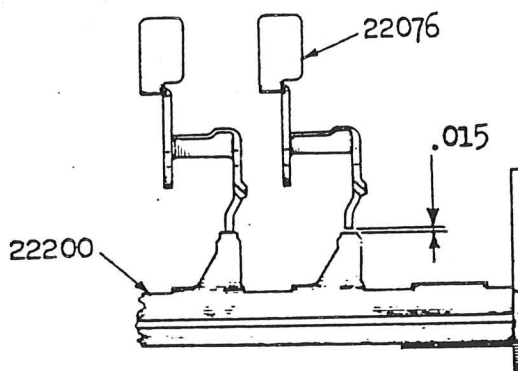


FIG. 588

that to the immediate left. Thus the sensing lever in line with the "5" does not actually contact its step on Gate 22200, and is therefore inactive as far as control is concerned, until the middle dials register about "0" whereupon the gate will be released to limit against the tail of the sensing lever in the units column. Fig. 588.

6. In each column of the machine (in line with the key sections) is a Sensing Lever Assembly 22065 including a Sensing Lever 22076, which is so constructed that when a key in that column is depressed, and the machine operated in division the Pivot Pin 22063, on which the sensing lever is pivoted, will stand at a height dependent upon the size digit of the key depressed. As the machine functions and the keyboard amount is subtracted from the corresponding middle dial, the dial rotates and the Finger 92270, which is controlled by the Snail Cam 92203, depresses the shelf (K) of the sensing lever in the control order, and as the shelf (K) is gradually depressed the tail (L) is raised until when the dial reading becomes about one-half as large as the divisor digit in line with it, or in any case by the time the remainder

# MARCHANT

## AUTOMATIC DIVISION . Cont'd

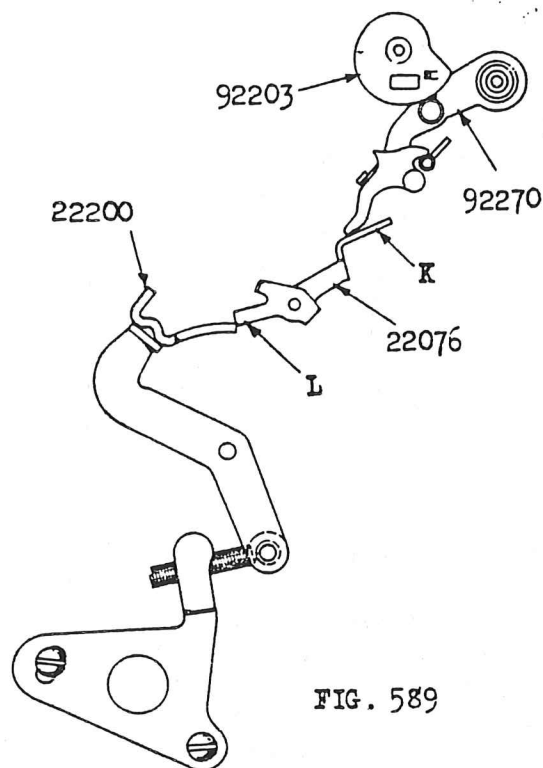


FIG. 589

on the dial is reduced to about halfway between "1" and "0", Gate 22200 is released from tail (L) of Lever 22076. Fig. 589.

7. Thus, considering the carriage dial in line with the left hand digit of the divisor and the two dials to the left of it, (which 3 dials are the only ones that come into control), if the registration of these three dials is more than about "080" tail (L) of the left hand lever blocks Gate 22200 until the remainder is reduced to about "050", when through Finger 92270 Snail Cam 92203 rocks tail (L) clear of the gate leaving the gate blocked by the middle sensing lever until the remainder becomes about "005" when the middle lever pulls clear of the gate leaving it blocked by the first lever, until the remainder becomes about one-half as large as the divisor digit, when it also pulls clear. Gate 22200 then rocks to the rear and causes the machine to stop at

the end of that cycle, take a plus stroke (which is in effect skipped if the machine has not overdrafted) and then shift left to the next column where the process is continued. Fig. 589.

8. In order that this control operation may be quite clear, position the 3rd carriage dial in line with the 1st key section (counting both from the right side of the machine). Set "14" in the 3rd and 4th middle dials. Set "2" in the 1st key section. Depress division key and operate machine manually. Watch the depression of the sensing lever controlled by the dial in the 3rd column. When the remainder is reduced to about "10" the sensing lever will become completely depressed but Gate 22200 will not move rearward as it is held by the sensing lever of the dial in the 4th position. As the machine operation is continued and the units dial passes from "0" to "9" this sensing lever again rises to be in a blocking position. When the dial in the 4th position rotates to a position about halfway between "1" and "0" the sensing lever controlled by the 4th dial will trip and Gate 22200 will move rearward to be stopped by the sensing lever of the 3rd dial. Continue operation until the dial reading has been reduced to "2"; take a spring hook and depress shelf (K) of Sensing Lever 22076 in the same column. It will be noted that Gate 22200 is released by the sensing lever and that the machine will stop dividing after the cycle of the main clutch has been completed, whereupon the carriage will shift left and the machine will start dividing in the next column. See Fig. 589.

9. Taking the same problem  $14 \div 2$  in detail, it will be found that



# MARCHANT

## AUTOMATIC DIVISION . Cont'd

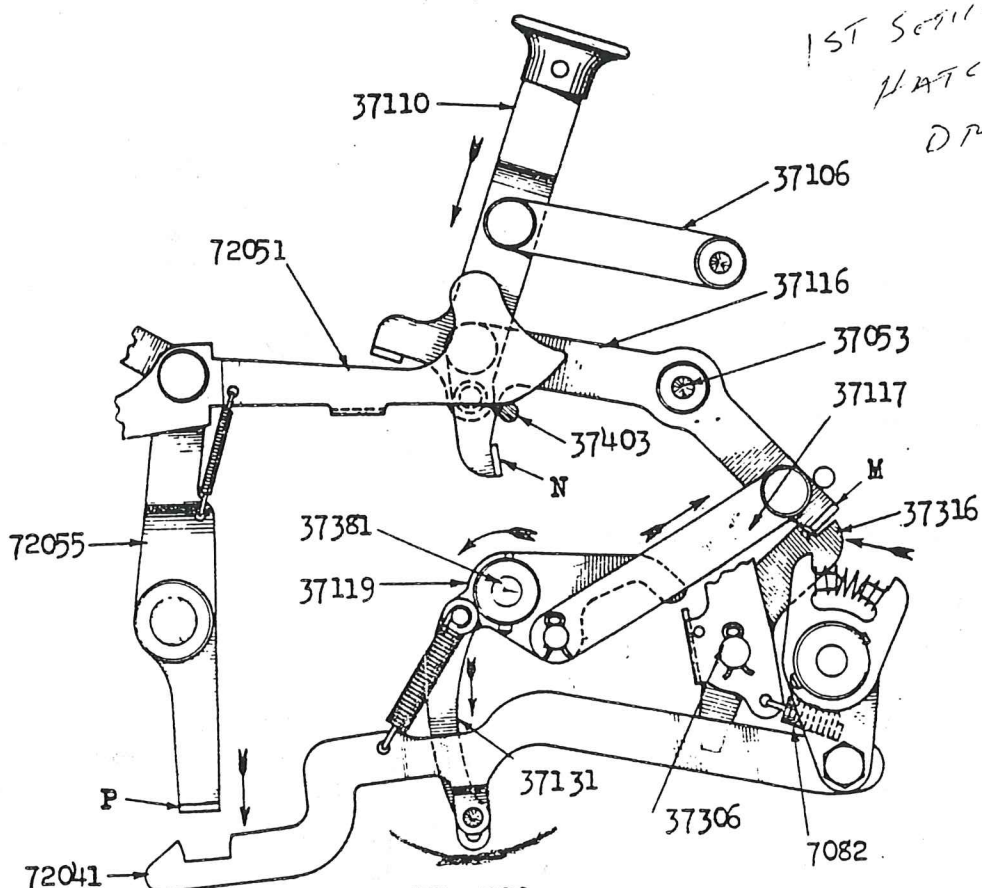


FIG. 590  
VIEW FROM LEFT

practically every phase of division is covered and the subject will therefore be presented in that manner. The student should follow the functions step by step operating the machine slowly by hand making certain that each step is thoroughly understood before proceeding with the next.

10. With all dials clear, set "14" in the 3rd and 4th middle dials. Clear the upper dials. Set "2" in the first key section directly beneath the "4". Depress the division key and operate manually. The depression of the Division Key 37110 rocks the parallel Links 37106 and 37116 down about their pivot Studs 37053 causing the Link 37117 to

rock Lever 37119, Shaft 37381 and Lever 67020; Levers 37119 and 67020 being pinned to the Shaft 37381. The Latch 37316 is rocked about Shaft 37306 by the Spring 7082 to position under ear (M) of the Lever 37116 thus holding the division key depressed. The forward end of Lever 72051 follows the ear (N) down which would permit automatic shifting but it is forced upward at once by the Stud 37403. See paragraph 15, page 460. Manual shift is disabled when the division key is depressed since it rocks Lever 37119 as described above, thereby lowering the Link 37131 which in turn lowers the Shift Connecting Link 72041 from engagement with ear (P) of the Lever 72055 Fig. 590.

# MARCHANT

## AUTOMATIC DIVISION . Cont'd

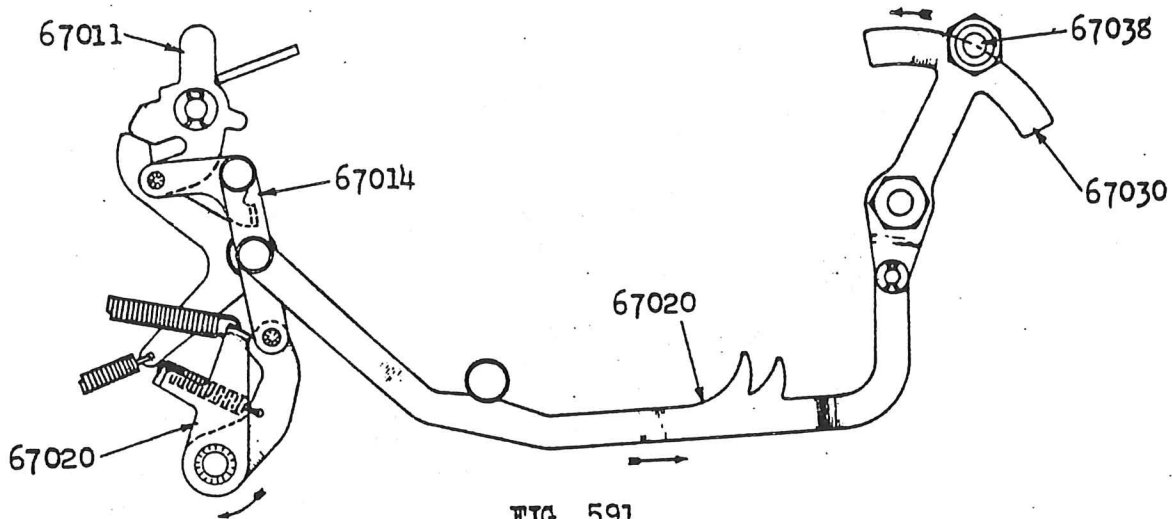


FIG. 591

11. Lever 67020, rocking forward, positions the counting mechanism for counting negative strokes. (See paragraph 6, page 450). Fig. 591.

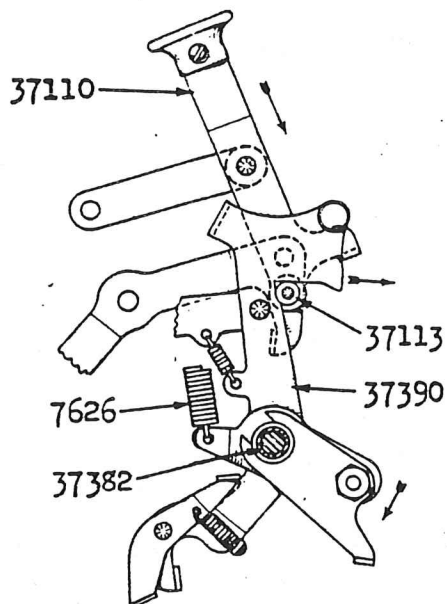


FIG. 592

12. As Division Key 37110 is depressed Roller 37113 on the division key is lowered below the hatchet-shaped head of Division Operating Lever 37390 allowing it to be rocked rearward about Sleeve 37382 by Spring 7626. Fig. 592.

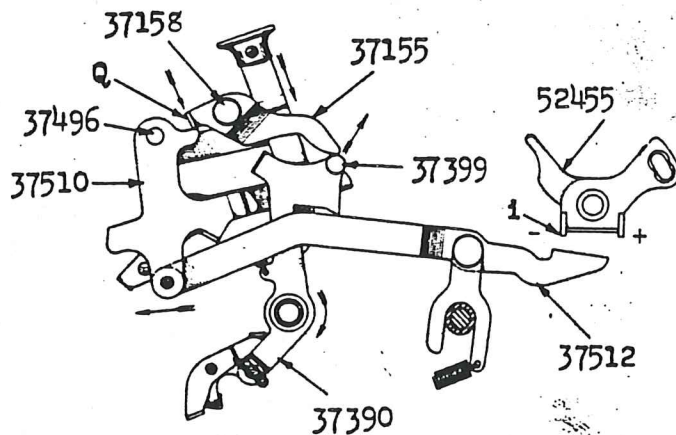


FIG. 593

13. As Lever 37390 rocks rearward Roller 37399 on that lever forces Lever 37155 to rock about the Stud 37158 and its ear (Q) contacts and rocks Lever 37510 about Shaft 37496 causing the nose of Arm 37512 to be positioned under the front lip (i) of the Fork 52455 for negative operation. Fig. 593.



# MARCHANT

AUTOMATIC DIVISION . Cont'd

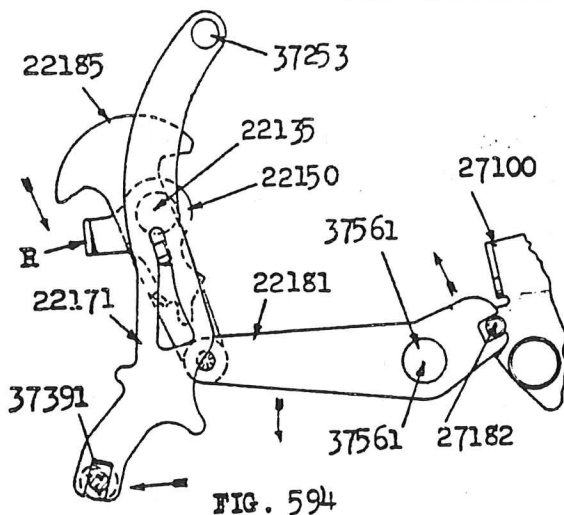


FIG. 594

14. Stud 37391, on the lower end of Lever 37390, rocks Arm 22171 forward about Tie Bolt 37253 to position Link 22185 over ear (R) of Release Arm 22150. Fig. 594.

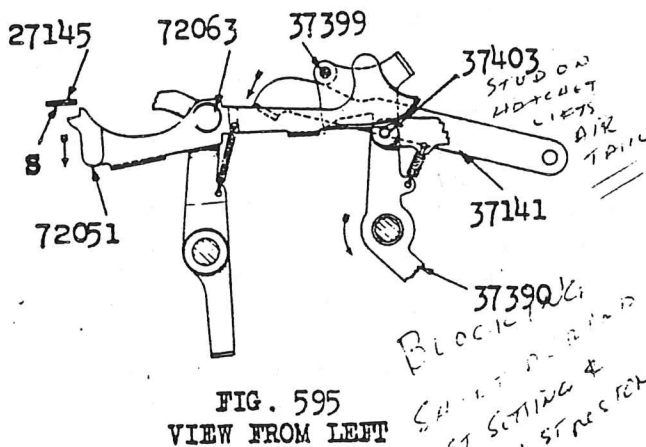


FIG. 595  
VIEW FROM LEFT

15. The long Stud 37403, on Lever 37390, cams the forward end of the Lever 72051 upward about Stud 72063 thus lowering the rear end of Lever 72051 from in front of the ear (S) of the Lever 27145. This disables the automatic shift until after the first carriage rise.

16. The Roller 37399 on the Lever 37390, forces the Bar 37141 down and rearward to trip the Dog 37590 and thus start the setting clutch as described under Addition, (paragraph 5, page 436). Fig. 595.

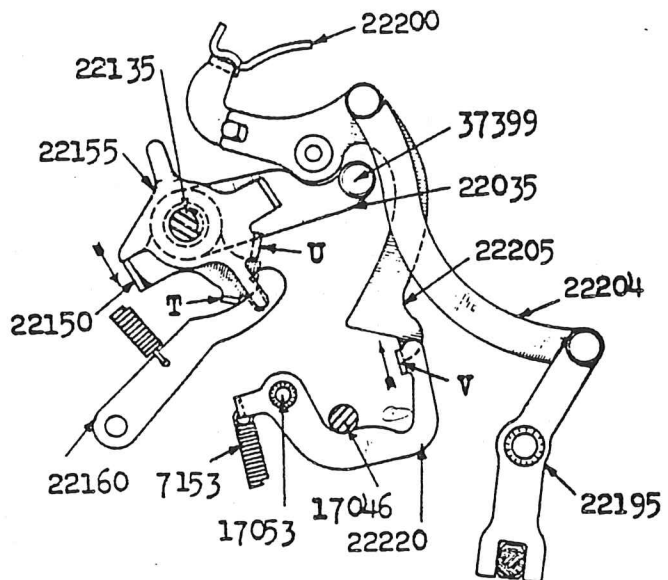


FIG. 596

17. As the setting clutch rotates Setting Shaft 27082, the Selection Shaft 17046 moves forward under action of the Cams 27020 to introduce the divisor into the Actuator Unit 32000. (See paragraph 3, page 404). This forward movement of the Shaft 17046 gradually releases the Delay Latch 22220 which is rocked upward about Shaft 17053 by the Spring 7153. Meanwhile the Cam 27090 rocks Follower 27100 about Shaft 27067, and the Stud 22182, (riveted to the follower) rocks the Lever 22181 about Shaft 37561 pulling Link 22185 down to contact ear (R) and thus rock the Arm 22150 about Shaft 22135. See Fig. 594. The ear (T) on Arm 22150 contacts and rocks the Latch 22160 free of the ear (U) on the Lever 22155 which it had been latching, and then the Arm 22150 contacts the ear (U) and rocks Lever 22155 and Shaft 22135 to which Lever 22155 is keyed. Lever 22035 which is keyed to Shaft 22135 is rocked upward by the shaft and the Roller 37399 on Lever 22035 which has been holding the lower end of the Arm 22205

# MARCHANT

## AUTOMATIC DIVISION . Cont'd

(connected to Gate 22200) in a rearward position is rocked into the clear, which would permit Gate 22200 to rock rearward but the lower tip of Arm 22205 is caught by ear (V) of Delay Latch 22220 thus detaining the gate until the sensing levers are in position. Fig. 596.

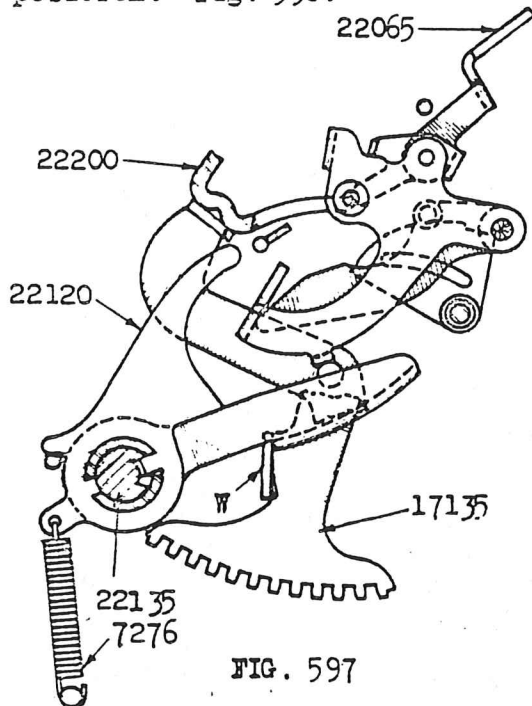


FIG. 597

18. The movement of Shaft 22135 also releases Sensing Blocking Levers 22120 (which are loosely keyed to it) so that they may be individually raised by Springs 7276 and thereby let their corresponding Sensing Lever Assemblies into operation. Fig. 597. However, only the Lever 22120 in line with the left figure of the divisor and the levers to the left thereof can respond because moving Segment 17135 in line with the left digit of the divisor out of its zero position has located the ear (W) of the segment over the curved shelf of Lever 22120 which controls the sensing lever in the order to the right.

Levers 22120 overlies each other in such a manner that when any one is held down all those to the right of it are thereby also held down. Thus, all Levers 22120 the right of the leftmost digit of the divisor are blocked and in turn prevent the corresponding Sensing Levers 22065 from dropping into operative position. Fig. 598.

19. Although the sensing lever assembly in line with the left digit of the divisor, and all to the left thereof, drops into sensing position they are not all effective to block the gate, for the middle dials to the left of the dividend stand at zero and hold their respective sensing levers out of blocking position. Only when the first digit of a dividend is so large that, as the carriage dips, the dial to the left is advanced almost to "1" does any sensing lever to the left of the dividend have an opportunity to come into active control. In the present instance the sensing lever in line with the left digit of the divisor and the one to its left, are the only ones that are let into an active position in which they serve to block Gate 22200.

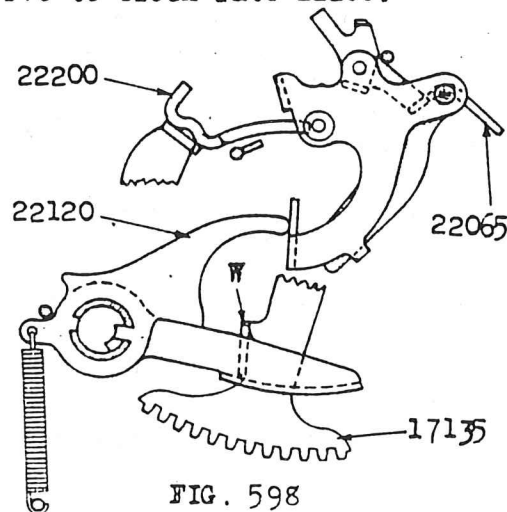


FIG. 598



# MARCHANT

## AUTOMATIC DIVISION . Cont'd

20. When Lever 22155 is rocked as described in paragraph 17, page 460, a lug (X) on the lever retracts from the long tail of Shift Lock 22165 and Spring 7017 rocks it about Shaft 22166 to engage the carriage and thus prevent any lateral movement of the carriage. (See Fig. 609, page 466).

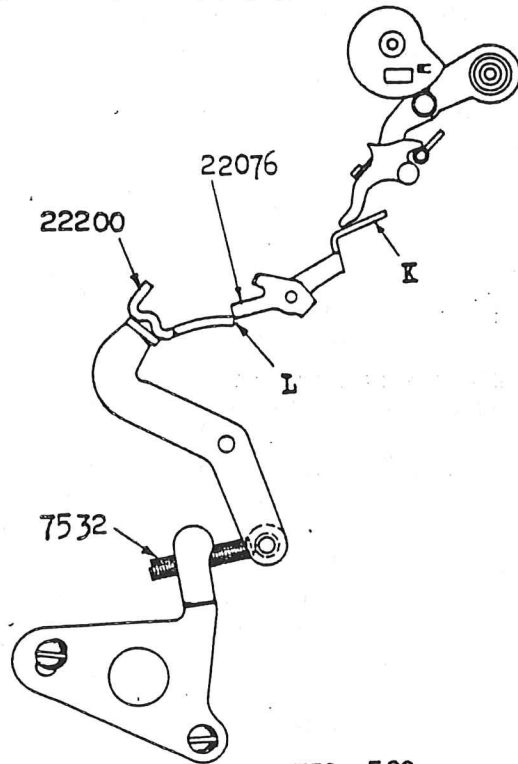


FIG. 599

21. Selection Shaft 17046 then moves to the rear, withdrawing ear (V) (See Fig. 596) from Arm 22205 permitting Gate 22200, actuated by Spring 7532, to rock rearward and limit against the tail (L) of Sensing Lever 22076 to the left of the one in line with the "2". Fig. 599.

22. Meanwhile the setting line has dipped the carriage and started the Main Clutch 52500 and, as the figures in the carriage dials are reduced, Fingers 92270 gradually de-

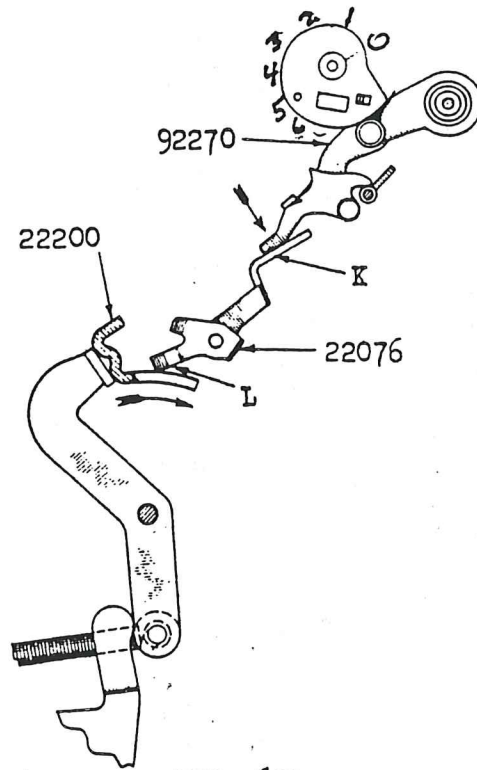


FIG. 600

press the corresponding sensing lever shelves (K). When the dial in the 4th position rotates to a position about halfway between "1" and "0" the sensing lever will trip and the gate will move rearward to be stopped by the sensing lever of the 3rd dial; and slightly before the reading of the 3rd dial becomes approximately one-half as large as the divisor, which dial reading in this case is "1", the Gate 22200 is released from tail (L) of the sensing lever and trips rearward. Fig. 600.

23. This movement of the gate is transmitted by the Arm 22205, Link 22204, and Lever 22195 (which make up Assembly 22190) to the Assembly 22240, rocking that assembly. (See Fig. 596). The front arm of Lever 22231, a part of Assembly 22240, engages ear (Y) of the Latch 37460, causing the latch to withdraw from

AUTOMATIC DIVISION, Cont'd

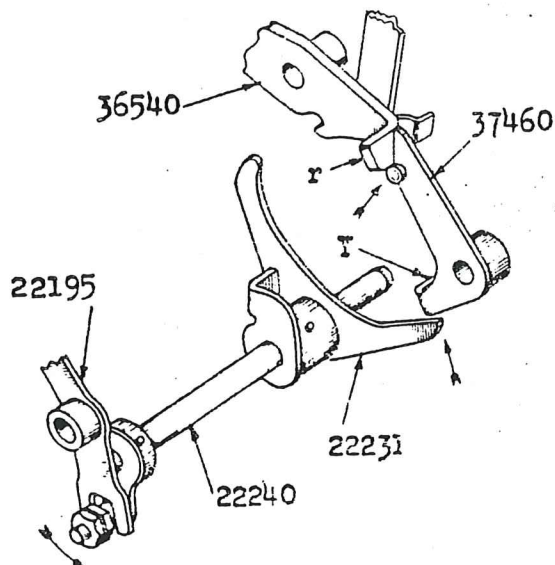


FIG. 601

beneath the ear (r) on the Dog  
36540 thus releasing the dog, stop-  
ping the main clutch, and starting  
a restore operation. (See 62000  
SECTION, paragraph 4, page 446).  
Fig. 601.

24. The restore clutch rotates the Cam 62071 which forces the Follower 62010 to rock forward about Screw 62018. The Follower 62010 moves the Link 37421, of Assembly 37415, forward and the tip (Z) contacts the ear (a) of the Lever 22235 rocking that lever forward about Shaft 22241.

Both Lever 22235 and Shaft 22241 are parts of Assembly 22240, therefore that assembly rocks and causes the Assembly 22190 to rock the Gate 22200 forward. The forward movement of the Link 37421 also rocks the Lever 37425 about the Sleeve 37382 causing the Live Point 37430 to contact the ear (b) of the Lever 37407, a part of Assembly 37390, causing the Assembly 37390 to rock forward about the Sleeve 37382 until it is retained by the Latch 37072 hooking over the ear (c).  
Fig. 602.

25. The restore cycle allows the carriage to rise causing the ear (S) of Lever 27145 to move forward and whenever that ear contacts the Lever 72051 forcing it forward, an automatic shift to the left is initiated. However, due to the timing, the long Stud 37403, of Assembly 37390, holds the forward end of Lever 72051 raised and the rearward end is thus depressed so that the ear (S) of Lever 27145 does not contact it and a shift of the carriage on the first restore stroke is thus prevented, (for automatic shift see paragraph 33, page 467). Fig. 603.

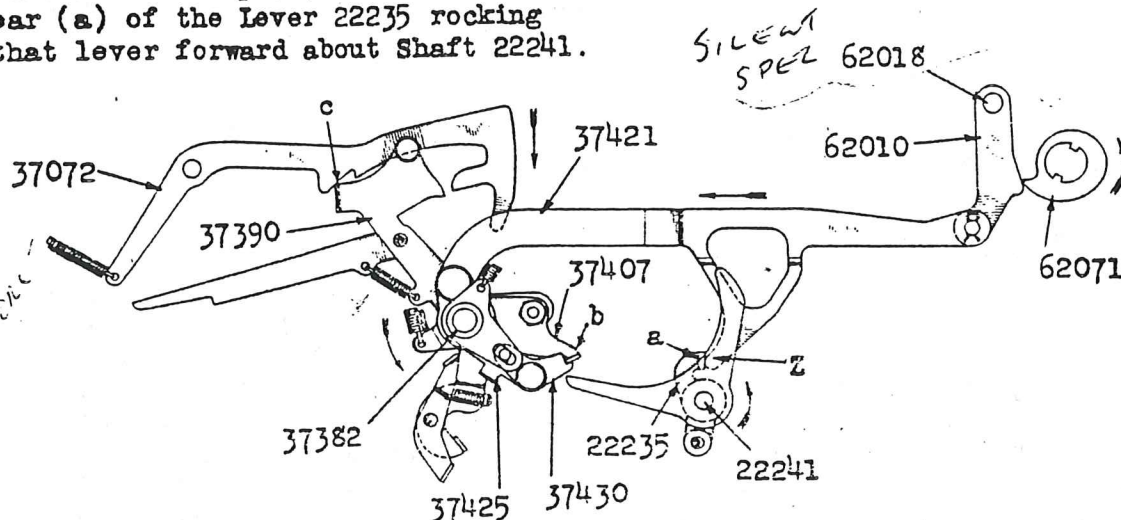


FIG. 602



# MARCHANT

## AUTOMATIC DIVISION . Cont'd

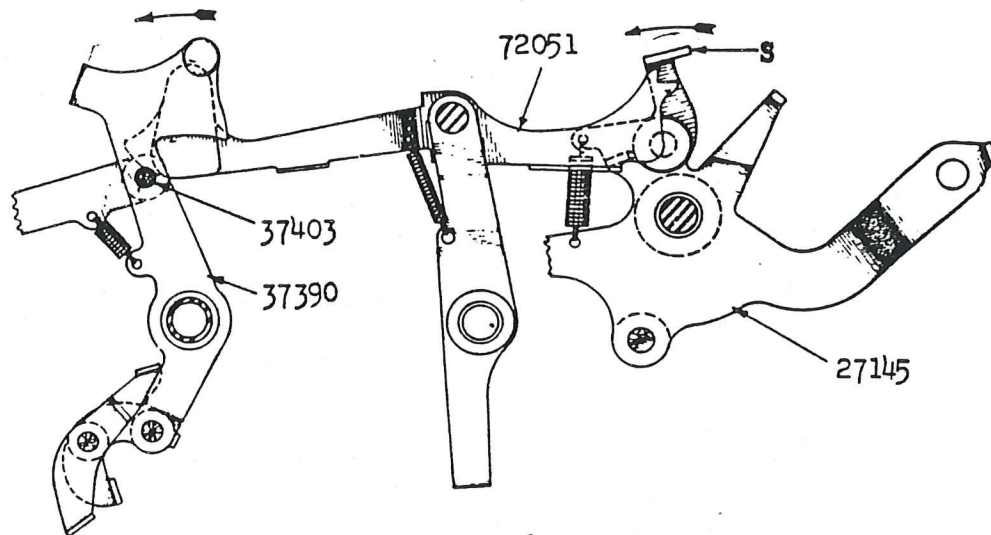


FIG. 603

26. As Division Lever 37390 is rocked forward, Roller 37399 moves forward away from Lever 37155 allowing that lever to rock about Stud 37158 and its ear (Q) releases Lever 37510 from its negative position. At the same time Roller 37399 releases Operating Bar 37141 permitting it to move up and permitting Link 37150 to again seat itself on ear (q) of Setting Clutch Dog 37590. Link 37402, a part of Assembly 37390, moving forward engages ear (d) of Plus Stroke

Bell Crank 37065 rocking it about Stud 37071 causing Roller 37068 to contact the edge of Lever 37510 forcing that lever to rock rearward into its plus position. (See Fig. 511, page 433). The rocking of Bell Crank 37065 also causes ear (e) to force Operating Bar 37141 down and rearward thus lowering Link 37150 to start the setting clutch (as described under addition, paragraph 5, page 436), preparatory to the plus stroke. Fig. 604.

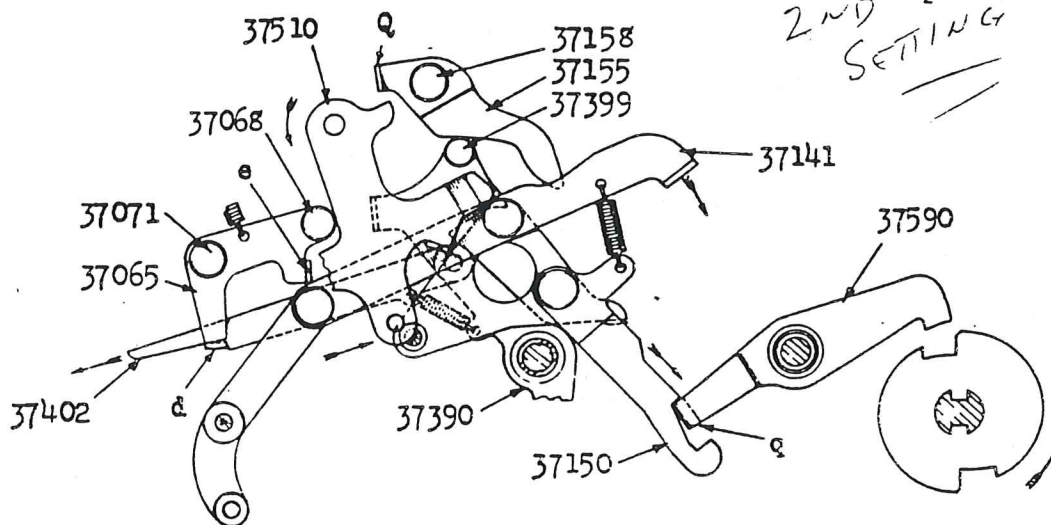


FIG. 604

# MARCHANT

AUTOMATIC DIVISION . Cont'd

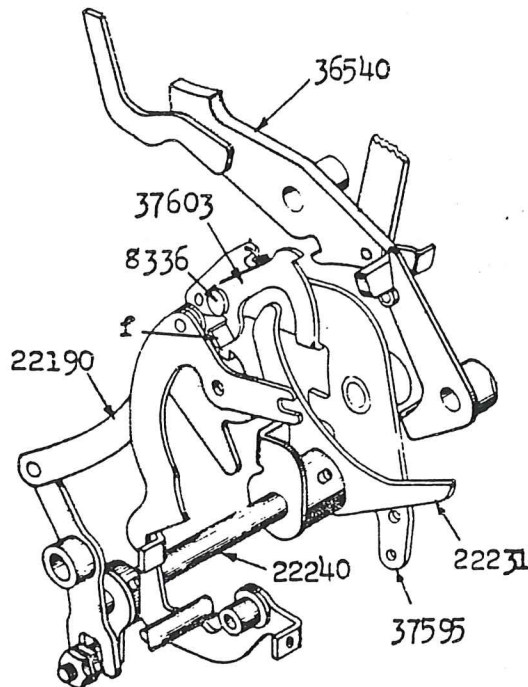


FIG. 605

27. As the end of the restore cycle is reached Follower 62010 drops off the high portion of Cam 67071 permitting Link 37421 to return, which in turn permits Gate 22200 to return to its rearward position unless blocked by some sensing lever. (See Fig. 602). This movement of the gate actuates Assembly 22190 and in turn Assembly 22240, causing the rear arm of the Lever 22231, a part of Assembly 22240, to engage ear (f) on Link

37603 and rock it down about Stud 8336 which pivots the link to the Starting Arm 37595. Therefore, when Starting Arm 37595 rises due to the rotation of Cam 27085, Link 37603 does not engage with the Dog 36540 but completely underrides it and the main clutch is not permitted to rotate. Accordingly none of the dials are moved, and what we may term a blank plus stroke has taken place. Fig. 605.

28. It has already been described how the Cam 27090, rotated by the setting shaft, rocks the Follower 27100 about Shaft 27067 causing the Stud 22182 to rock the Lever 37580 about the Shaft 37561 and kick off Link 37150 so as to limit the setting clutch to one stroke, (paragraph 8, page 437). The rocking of the Lever 37580 also causes it to engage ear (g) on the Lever 37385 so as to rock it about the Sleeve 37382, so that ear (h) on the Lever 37385 rocks the Link 37402 up from engagement with the ear (d) of the Plus Stroke Bell Crank 37065. The Spring 7150 rocks Bell Crank 37065 up to its normal position. This allows the Bar 37141 to rock upward stopping the main clutch as described in paragraph 20, page 441. Fig. 606.

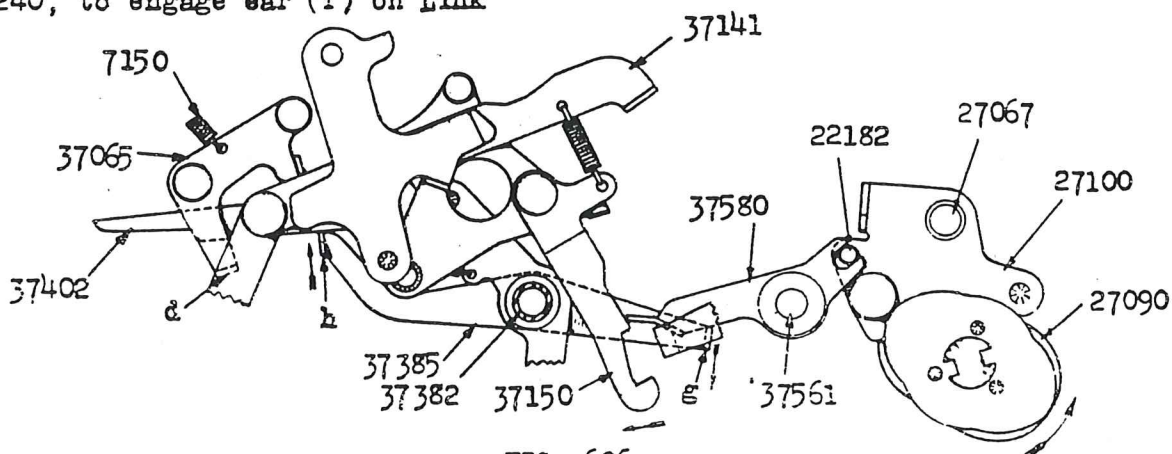


FIG. 606



# MARCHANT

AUTOMATIC DIVISION . Cont'd

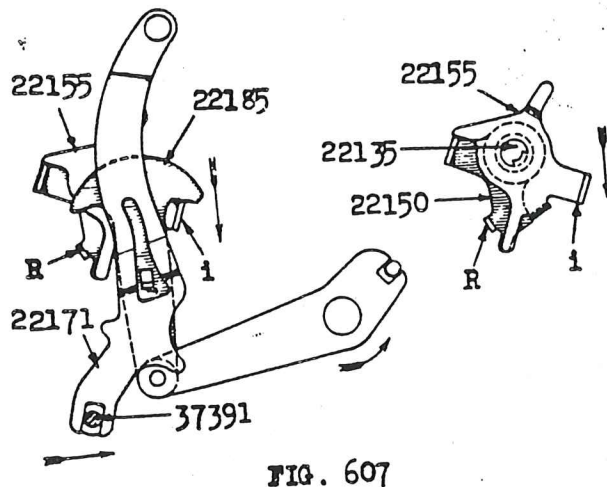


FIG. 607

29. When Lever 37390 was recocked by the restore cycle as described in paragraph 24, page 463, the Stud 37391 was moved to its rearward position causing Arm 22171 to rock rearward moving Link 22185 so that the forward hook of Link 22185 no longer is over ear (R) of Release Arm 22150, but instead the rear hook thereof is now over ear (i) of Lever 22155 which is keyed to Shaft 22135. Fig. 607.

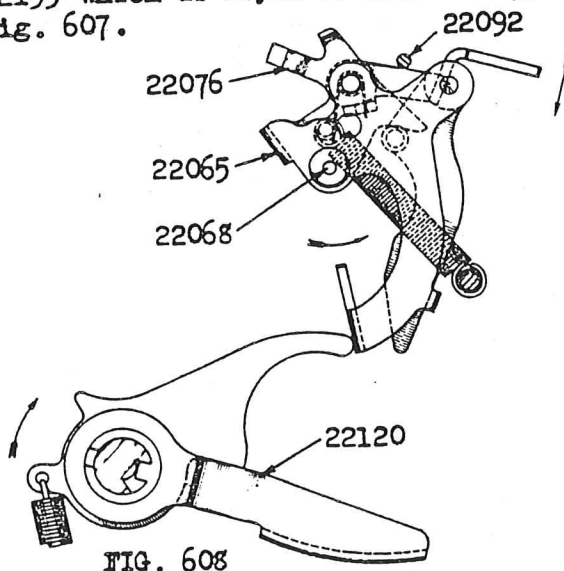


FIG. 608

30. The setting clutch cycle instituted by the plus stroke bell crank causes Link 22185 to be pulled down just as in the first setting clutch cycle (see paragraph 17, page 460) but instead of pulling down on ear

(R) to release the sensing levers as formerly, it now pulls down on ear (i) of Lever 22155 rocking Shaft 22135 to the rear, allowing Latch 22160 to drop over ear (U) of the Lever 22155 (see Fig. 609) to prevent the shaft from rocking back, and at the same time pulling down Levers 22120 which are loosely keyed to it thus rocking Sensing Lever Assemblies 22065 about their Pivots 22068, and causing Sensing Levers 22076 to be cammed down by Shaft 22092 out of the path of the carriage which is about to shift. Fig. 608.

31. At the same time Lever 22035, which is also keyed to Shaft 22135, is rocked down to rock Gate 22200 forward preparatory to another division cycle and lug (X) on Lever 22155 contacts the long tail of the Shift Lock 22165 rocking the shift lock about Shaft 22166 out of engagement with the carriage. Fig. 609.

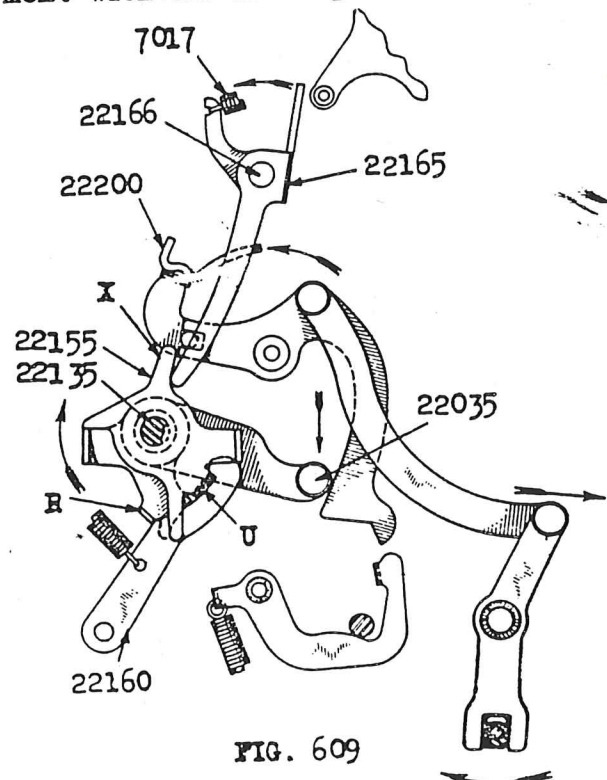


FIG. 609

# MARCHANT

AUTOMATIC DIVISION . Cont'd

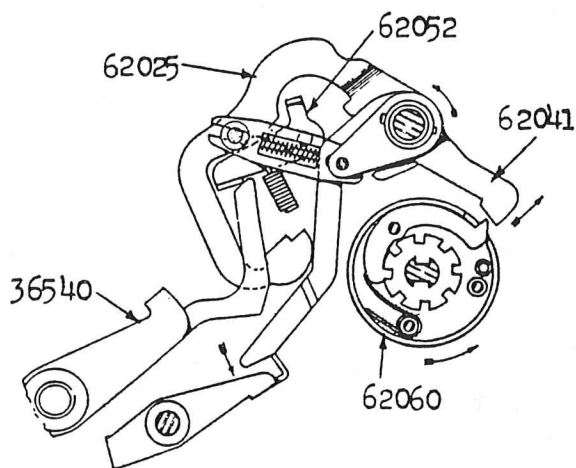


FIG. 610

32. As the Dog 36540 was not withdrawn from the main clutch, Latch 62052 was not allowed to function and the Lever 62025 therefore dropped with Follower 37530 thus withdrawing Dog 62041 from the Restore Clutch 62060 and permitting it to rotate. (See 62000 SECTION, paragraph 4, page 446). Fig. 610.

33. The rocking forward of Division Lever 37390 (paragraph 24, page 463) also removed Stud 37403 from the forward end of the Lever 72051, thus allowing Spring 7226 to position the rear end in front of ear (S) of Lever 27145. As the carriage rises under control of the restore clutch it rocks the Carriage Positioning Lever 27145 about Shaft 27067. Ear (S) of that lever contacting the nose of Lever 72051 pushes it forward causing Link 72060 to pull forward and through a spring connection rocks Bell Crank 72085 about the Stud 52069 to engage Ratchet 72181, in which position it is latched by Pawl 72093, and a shift to the left is started. (See 72000 SECTION, paragraph 2, page 452). Fig. 611.

34. Rotation of Shift Jack Shaft Assembly 72190B causes the floating Cam 72210 to unlatch Pawl 72093 from ear (J) of Bell Crank 72085 (see Fig. 611), and the floating Cam 72215 rocks Lever 72105A about Shaft

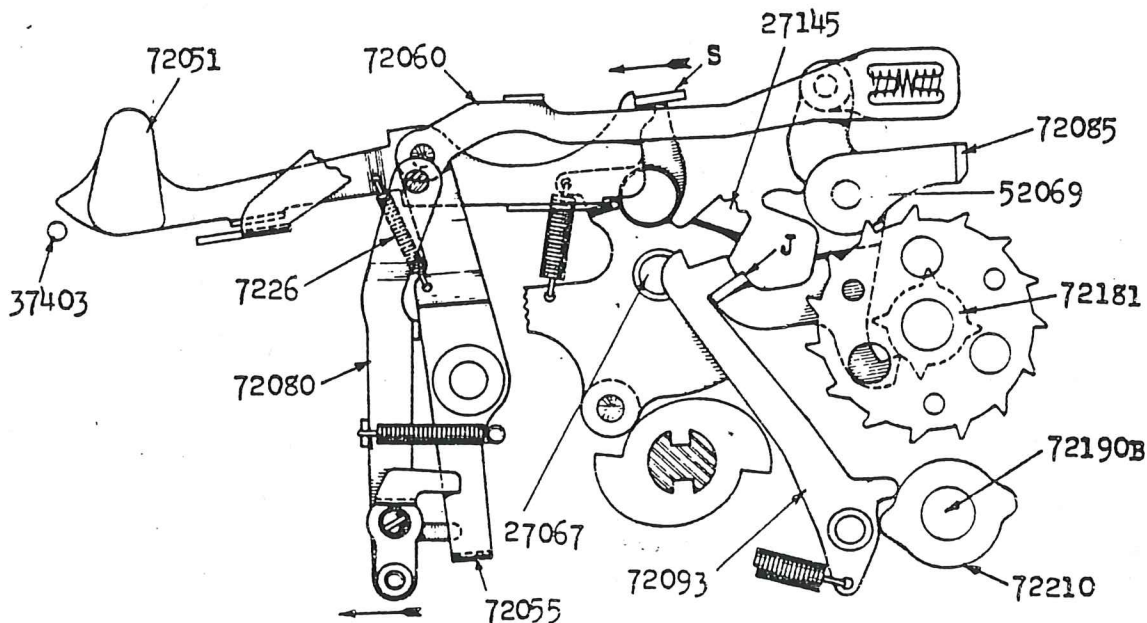


FIG. 611



# MARCHANT

## AUTOMATIC DIVISION . Cont'd

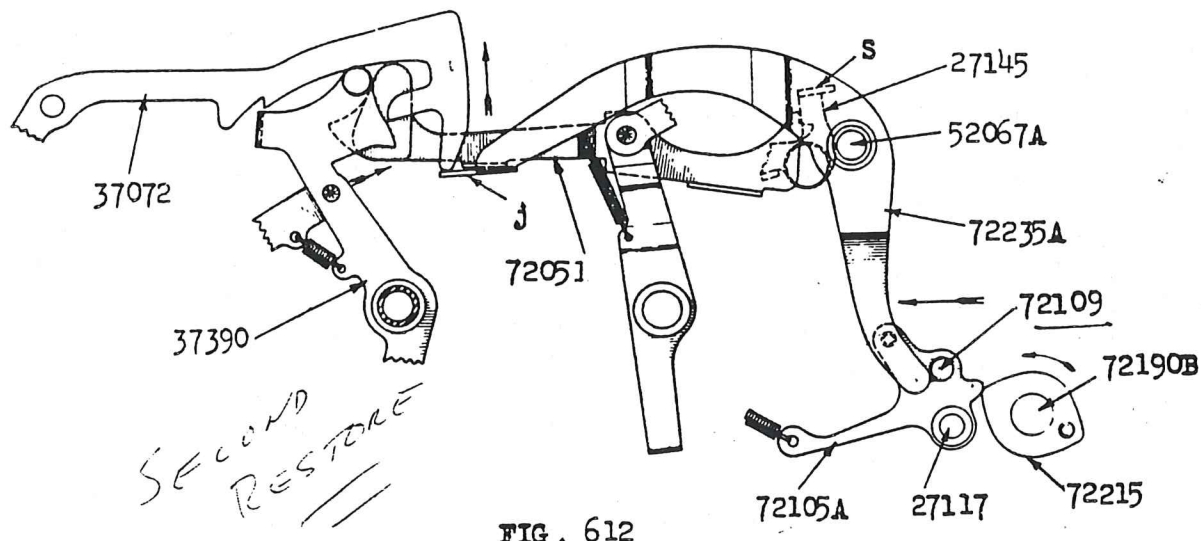


FIG. 612

27117 causing Stud 72109 to contact and rock the Restart Bell Crank 72235A about Stud 52067A. Shelf (j) on the front end of the restart bell crank raises the front end of Lever 72051 thus lowering its rear nose from contact with the ear (S) of Lever 27145. Fig. 612. With Pawl 72093 and Lever 72051 both freed, Bell Crank 72085 is brought back to its neutral position by the action of Centralizer 72080 on the Lever 72055. (See Fig. 611). Shelf (j) also raises the nose of Latch 37072 causing the latch to release Division Lever 37390 thus starting another division cycle. Fig. 612.

35. During this second restore cycle Lever 37425 rocks Live Point 37430 rearward as described in paragraph 24, page 463. However, this time Assembly 37390 is held in its forward position by the Latch 37072 and Lever 37407 is not in a position to be contacted by the live point as it starts its rearward movement. Division Live Point Guide 37435 so directs the movement of the Live Point 37430 that very shortly after it has started rearward its nose is moved upward from the path of the ear (b) of Lever 37407. So

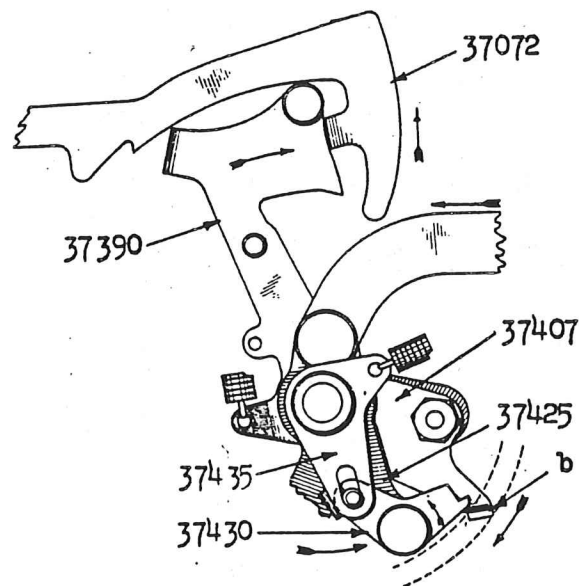


FIG. 613

when the Assembly 37390 is released to rock rearward and start another division cycle as described in paragraph 34, the Live Point 37430, which is still rocking rearward, is not in a position to block it as ear (b) completely overrides the live point. Fig. 613.

# MARCHANT

## AUTOMATIC DIVISION . Cont'd

36. On the first cycle of the main clutch "2" will be subtracted from "0" while the counting dial will register "1". The middle dials being at "zero" position Fingers 92270 depress sensing lever shelves (K) so that tails (L) cannot block Gate 22200. Therefore when the division gate is released as a result of the starting of the new division cycle it rocks right through to the rear and actuates Assembly 22190 and in turn Assembly 22240. The forward arm of Lever 22231, a part of Assembly 22240, as previously explained (see paragraph 27, page 465), releases Latch 37460 from beneath ear (r) of Main Clutch Dog 36540 thus stopping rotation of the main clutch at the completion of its first cycle. Even though the gate goes right through when first released it cannot prevent the main clutch from taking one cycle since the release of the gate does not occur until after Starting Arm 37595 has been raised far enough for the upper tip of Link 37603 to hook in over the corresponding tip of Dog 36540 thus preventing rocking down of Link 37603. This insures the main clutch always taking at least one negative turn, and critical conditions which might otherwise occur when the dividend is approximately equal to the divisor are avoided. During the one subtractive cycle which now takes place in the present problem, "2" will be subtracted from "0" in the middle dials, and the active upper dial will be advanced to "1".

37. The restore stroke which follows, rocks the Gate 22200 forward through the action of the Assembly 37415 on ear (a) of Lever 22235 and also restores Division Lever 37390 which is latched by Latch 37072. (For detailed description see paragraph 24, page 463).

38. As the carriage rises a "carry wave" is transmitted to the left of the active middle dial and an over-draft appears with the middle dials registering 999.....9800. The dials to the left of the divisor now all register more than their corresponding divisor digits, each registering "9" as compared to a divisor digit of "0"; therefore Fingers 92270 which follow Snail Cams 92203 permit the shelves (K) of the sensing levers to rise into blocking position. Gate 22200 having been cocked forward just as this "carry wave" was completed, is released and allowed to limit against tail (L) of the leftmost sensing lever. As a result Assembly 22240 is held in such a position that the rear arm of Lever 22231 does not contact with ear (f) of Link 37603 on Starting Arm 37595 and the main clutch is allowed to rotate after the setting clutch starts to function during the plus stroke. (See Fig. 605, page 465).

39. A true plus stroke, therefore follows and the active dial is turned back to "0". The carriage dip brought the remaining dials to "0" and with the controlling dials driven to "0" they all remain at "0". The plus stroke, reversing the operation of the Counting Finger 67060, rotates the active counting dial one digit to correct its registration back to "0".

40. On the following restore stroke the carriage rises from engagement with the actuator unit and the ear (S) on the Lever 27145 contacts the rear nose of the Lever 72051 thus causing a carriage shift (see Fig. 611) and a restart of the division operation which continues until the last column is reached.



# MARCHANT

AUTOMATIC DIVISION

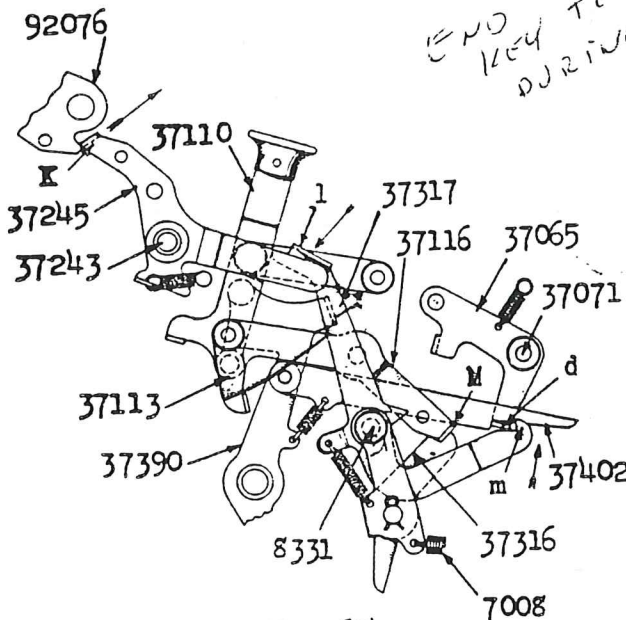


FIG. 614  
VIEW FROM LEFT

41. As the carriage shifts left into the last position, the Carriage End Plate 92076 engages ear (K) of Lever 37245 rocking that lever about Bearing 37243 causing the front arm of the lever to lower from under ear (L) of Lever 37317 allowing that lever to be rocked by Spring 7008 about Stud 8331, on which it is pivoted to Latch 37316, and position hook (m) of Lever 37317 into the path of ear (d) of Plus Stroke Bell Crank 37065. During the first restore stroke Link 37402 contacts ear (d)

and rocks Bell Crank 37065 forward about Stud 37071 as described in paragraph 26, page 464. Ear (d) picks up hook (m) carrying it forward with it and this causes Lever 37317 to rock Latch 37316 out from under ear (M) of Division Key Link 37116 thus unlatching Division Key 37110. Fig. 614. The restoring movement of Lever 37390 rocks it clear of the Roller 37113 on the lower end of the division key with the result that the key restores to normal under tension of Spring 7050 on Lever 67020 acting through Shaft 37381 and division key linkage. (See Figs. 590 and 591). When the division key rises, Lever 67020 is rocked forward tensioning Spring 7153. This spring pulls the counter reverse control linkage forward causing the counter to reverse if not prevented by some means. In order to hold the counter mechanism from reversing until after division is completed an ear (n) is provided on Switch Control Bell Crank 82155 and this ear is positioned in front of one or the other of two horns (p) on Link 67026 preventing that link from moving forward and the counter reversing until Starting Switch 82130 is opened. (See paragraph 5, page 428). Fig. 615.

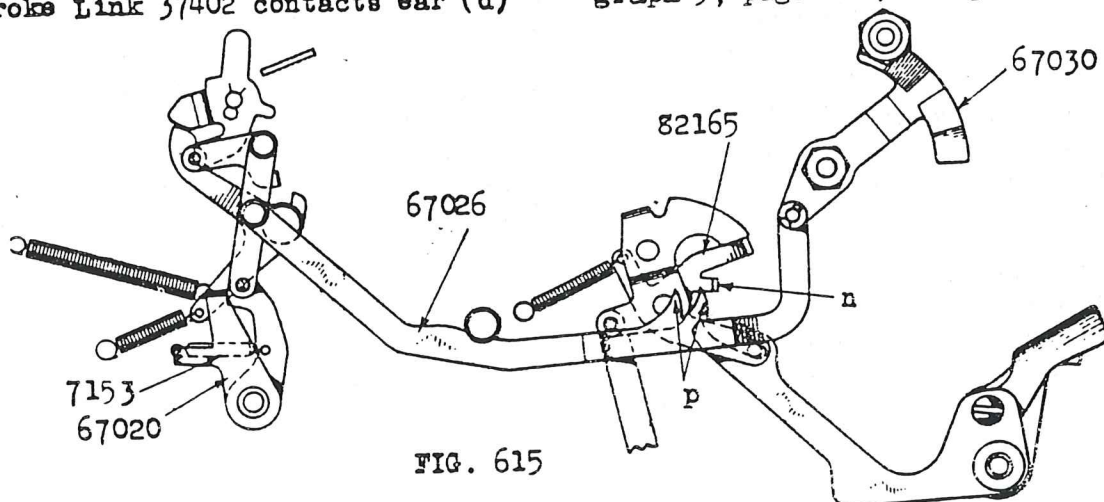


FIG. 615

# MARCHANT

## AUTOMATIC DIVISION *Cont'd*

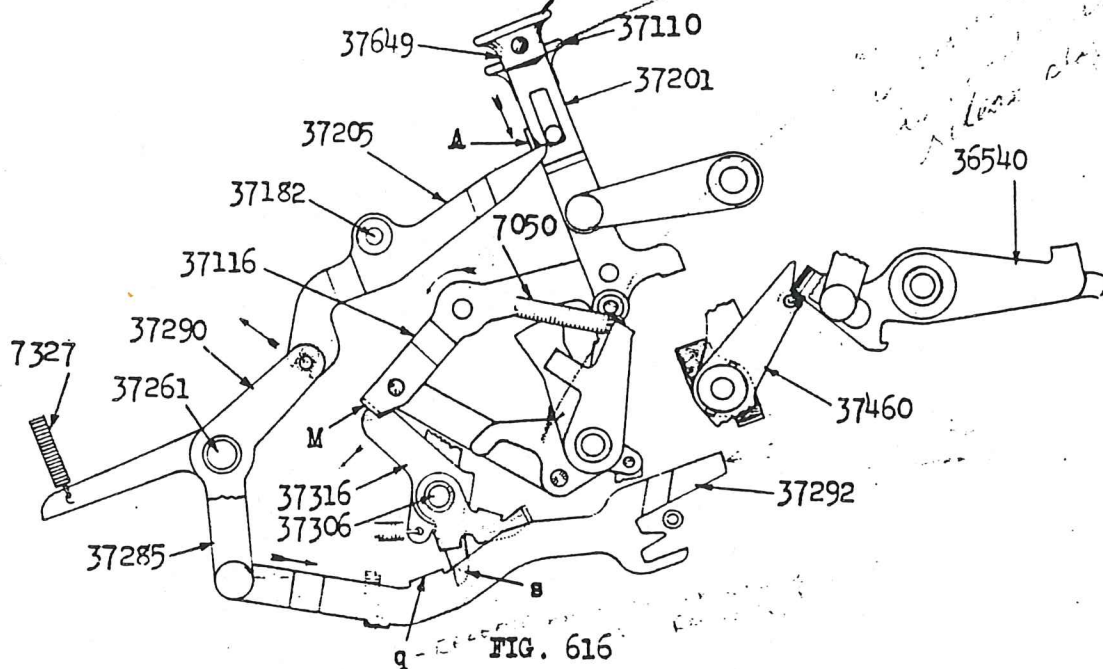


FIG. 616

42. The problem which has been illustrated covers practically all phases of division but in order that the subject may be perfectly clear the student should perform different problems involving changing the control order, so that the principal is thoroughly understood.

### Stop Key Operation:

43. If it is desired to stop division before the last position has been reached, the stop key is depressed once. Upon depression of Stop Key 37649 ear (A) of the Stem 37201 forces Lever 37205 to pivot about Stud 37182 rocking the Lever 37290, of Assembly 37285, about Shaft 37261 forcing Link 37292 rearward causing shelf (q) to contact tail (s) of Latch 37316 and rock the latch about Shaft 37306 forward from under ear (M) of Lever 37116. Ear (M) lowers enough to prevent Latch 37316 from again dropping under it when pressure on Link 37292 is removed and the division key restores to normal under tension of Spring 7050 when released

by the Lever 37390 on the restore stroke which takes place when division is completed in the order in which it is then operating. When the stop key is released it restores to normal due to the action of Spring 7327 on Assembly 37285. Fig. 616.

### Emergency Stop in Division:

44. When it is desired to stop immediately without waiting for completion of division in the current order (as for instance, with a set-up in the product dials but not in the keyboard) the stop key is depressed a second time. On the same pivot Shaft 37306 with Latch 37316 is a Guide 37320 which is arranged to be rocked with the latch in such a manner that when Latch 37316 is in latching position under ear (M) of Link 37116, ear (t) of the guide presses Link 37292 down into a position in which its rear tip (u) overrides and misses ear (v) on Lever 37450 pinned to Shaft 37446 and integral with Roller Latch 37460. When, however, Latch 37316 is rocked



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## AUTOMATIC DIVISION . Cont'd

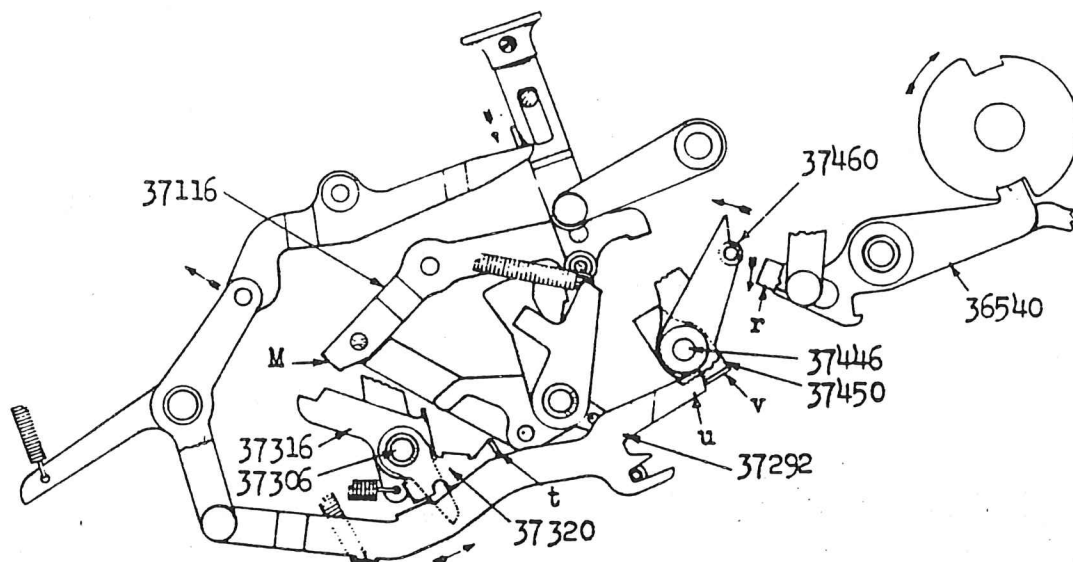


FIG. 617

forward from under ear (M) then ear (t) of the Guide 37320 is rocked upward allowing Link 37292 to rise into a position in which upon being pushed to the rear its tip (u) will engage ear (v) and rock Roller Latch 37460 out from under ear (r) of Dog 36540 thus stopping the machine. Fig. 617.

45. Upon a single depression of the stop key therefore, Latch 37316 is rocked to unlatch the division key and to rock Guide 37320 into a position in which Link 37292 will, under another stop key depression, trip the roller latch, but the division key cannot actually rise and the division be stopped until the roller latch is tripped, either by Gate 22200, due to completion of work in the order or by another depression of the stop key.

### Manual Restoration of the Division Key:

46. Should the machine stop during a division operation and it is desired to restore the division key to normal, a depression of the stop key will release Latch 37316 from

the division key assembly but it will also be necessary to reach through the rectangular opening of the bottom cover and press the Lever 37404, of Assembly 37390, to the rear. When pressure is applied to Lever 37404 it first rotates about Stud 37406 and its ear (w) raises Lever 37385 causing ear (h) to raise Lever 37402 so that it will not contact ear (d) of Bell Crank 37065 when the Division Lever 37390 is rocked forward. Further movement causes Lever 37404 to contact ear (x) and force Division Lever 37390 to rock forward to normal position. When the division lever is rocked forward the division key is returned to normal position by Spring 7050. (See Fig. 617). Fig. 618.

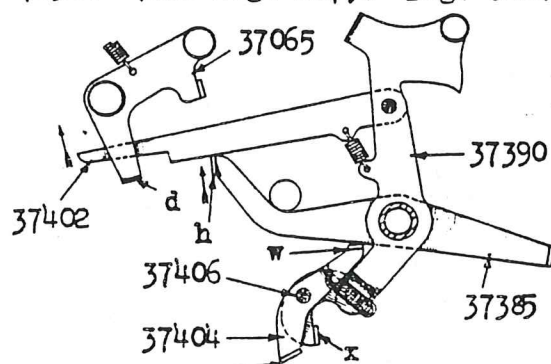


FIG. 618

# MARCHANT

## INTERLOCKS

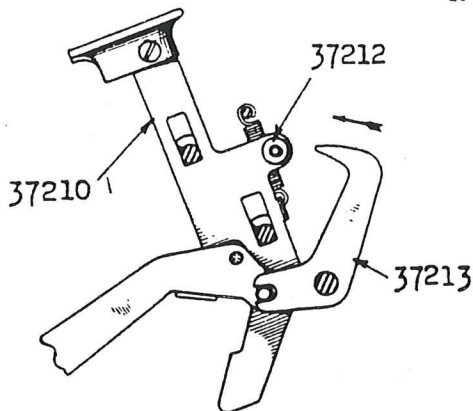


FIG. 628

1. The machine is equipped with various interlocks which protect it against misoperation. When the add or multiply bars are operated, Mimus Bar Interlock 37213 is rocked and its nose is positioned beneath Stud 37212 to block a depression of Short Cut Bar 37210. When Short Cut Bar 37210 is depressed Interlock 37213 overrides Stud 37212 and holds the short cut bar down to insure negative operation. Fig. 628.

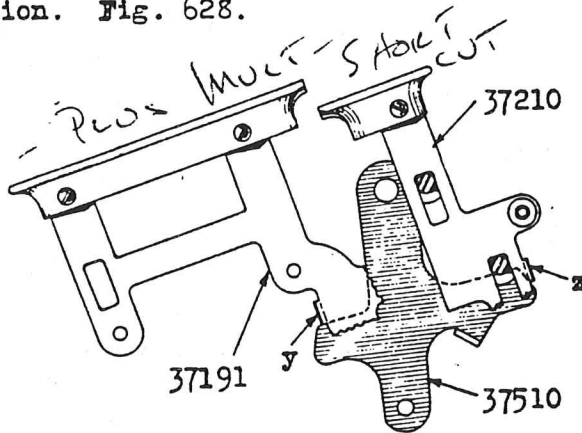


FIG. 629

2. A depression of Short Cut Bar 37210 causes the ear (z) to contact the rear arm of Lever 37510, of the Assembly 37495, rocking that lever forward where the front arm of Lever 37510 contacts ear (y) of Multiply Bar 37191 thus preventing depression of the multiply bar. Fig. 629.

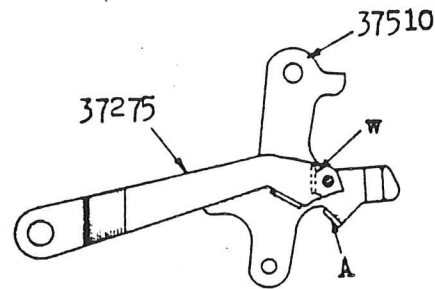


FIG. 630

3. Whenever Lever 37275 is depressed for a plus operation ear (w) is positioned in front of lug (A) on the Lever 37510 thus holding that lever from moving forward to negative position. For a negative operation ear (w) is positioned in the rear of the lug (A) thus holding that lever from moving rearward to a plus position. Fig. 630.

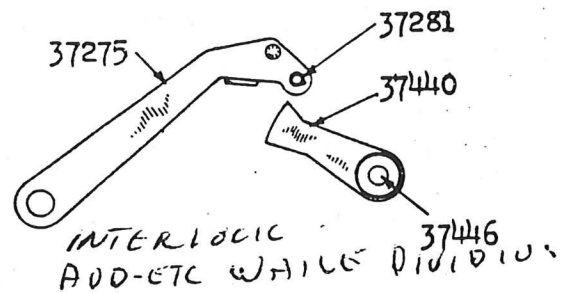


FIG. 631

4. Division Interlock 37440 is pinned to Shaft 37446 and when the division key is depressed it is rocked rearward (see Fig. 590) under Stud 37281 thus blocking depression of the add, subtract, multiply, and short cut bars. When one of those bars is depressed Stud 37281 on Lever 37275 rocks down in rear of Division Interlock 37440 and prevents depression of the division key. Fig. 631.



# MARCHANT

INTERLOCKS  
Acted - while  
CRITICAL

INTERLOCKS . Cont'd

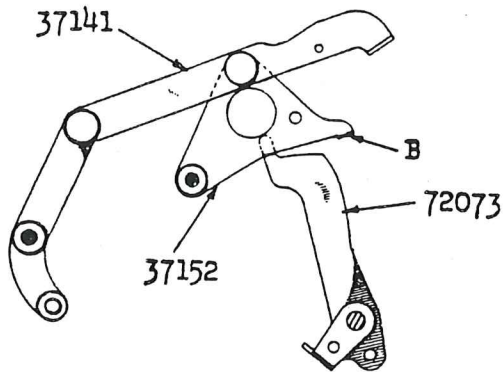


FIG. 632

5. Operation of the shift rocks the Shift Interlock 72073 rearward to underlie the ear (B) on Link 37152. This prevents the lowering of Main Operating Bar 37141 and the starting of the setting clutch. If any operating bar is depressed, ear (B) drops onto Interlock 72073 and postpones the starting of the setting clutch until the shift is completed and Interlock 72073 withdraws allowing ear (B) to fall and open the setting clutch. Whenever ear (B) is lowered to rear of the

Shift Interlock 72073 by any operating key, the shift interlock is prevented from rocking rearward and thus prevents shift operation. Fig. 632.

6. Whenever the carriage is dipped, Spring 7150 pulls the Setting Clutch Interlock 37585 rearward under the ear (x) on Bar 37141 thus preventing the lowering of Main Operating Bar 37141 and the starting of the setting clutch. When the carriage is raised the Roller 9199 on Lever 27145 rocks Lever 37610, Shaft 37561, and Interlock 37585 forward to clear ear (x) thus allowing setting clutch operation. Fig. 633.

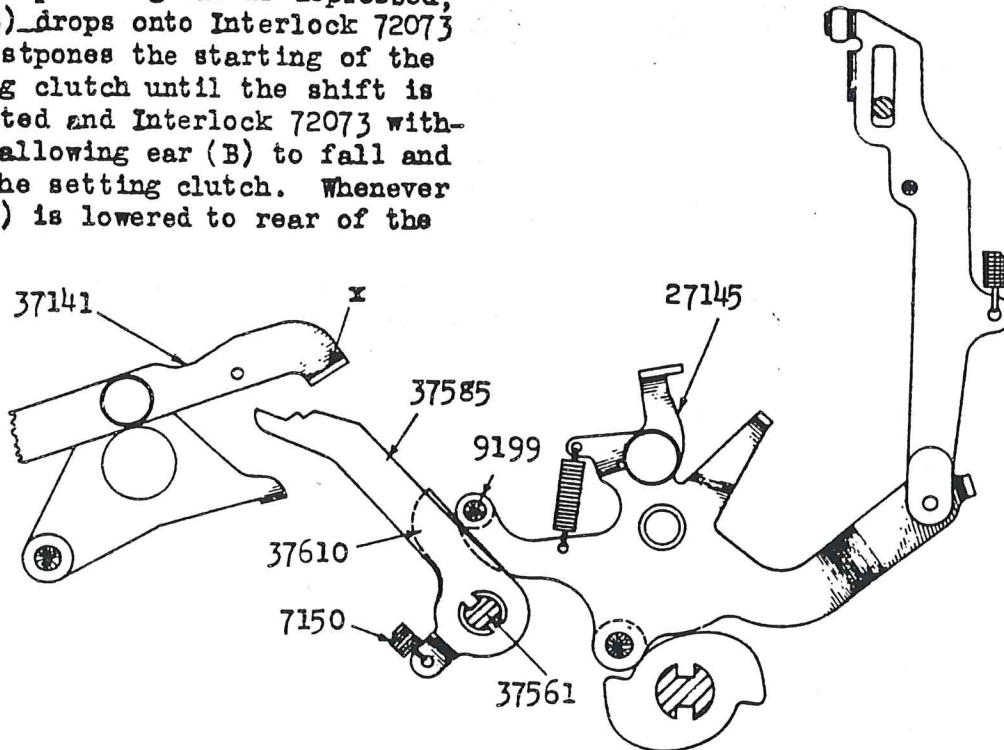


FIG. 633

# MARCHANT

## INTERLOCKS . Cont'd

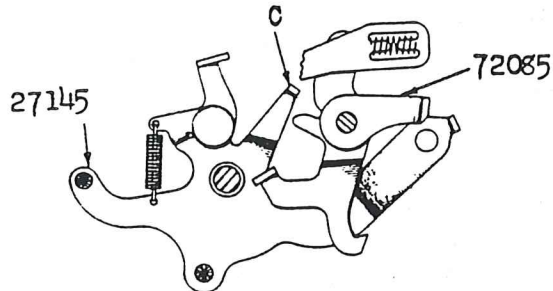


FIG. 634

7. Ear (C) on Lever 27145 engages in notch of the Shift Engaging Bell Crank 72085 whenever the carriage is dipped and holds the bell crank from engaging with the shift ratchets thus preventing a carriage shift whenever the carriage is in a dipped position. Fig. 634.

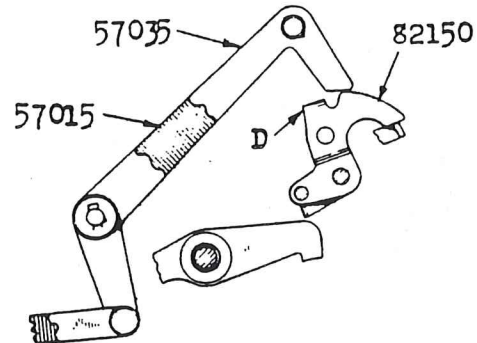


FIG. 635

8. The Switch Control Assembly 82150 acts as an interlock to prevent the setting clutch, main clutch, or restore clutch operating at the same time as the clear clutches. If the machine is clearing, the nose of Lever 57015, or, of Lever 57035, is rocked down in the rear of the ear (D) on Assembly 82150 thus blocking that assembly which in turn holds the various clutch dogs in the notches of their respective clutches. If any of these clutches are operating the dogs rock the Assembly 82150 so that ear (D) underlies the nose of Levers 57015 and 57035 thus blocking depression of the carriage dial clear keys. Fig. 635.





**MERCHANT**

**MODEL - M  
SERVICE  
INSTRUCTION  
BOOK**

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86-602-625

AUTOMATIC MULTIPLICATION - - - - -	602
NO. 2 TO NO. 9 KEYS - - - - -	602
NO. 1 KEY - - - - -	607
ZERO KEY - - - - -	607
TRIP UNIT SELECTION - - - - -	610
TRIP UNIT - - - - -	611
SHIFT - - - - -	613
SHORT CUT KEY - - - - -	616
ADDITION AND SUBTRACTION - - - - -	617
ADD BAR - - - - -	617
AUTOMATIC KEY RELEASE - - - - -	618
RECOCKING OF OPERATING LEVER - - - - -	619
NON SHIFT CONTROL - - - - -	619
SUBTRACT BAR - - - - -	620
STOP KEY - - - - -	621
INTERLOCKS - - - - -	623



To ...

1. Release Key

2. Front of Forward Gear ...

a. Forward Division

b. CLUTCH SWITCH CONTROL

c. CLUTCH-LESS POWER OR ...

✓ 2. POWER SET TO CLUTCH STAGE ...

✓ 3. REMOVE ... FROM MULT ...

✓ 4. ...

5. ... MULT SELECTION ...

6. ... LOWER ... CLUTCH ...

✓ 7. ... LOWER ...

✓ 8. ... SETS MASTER ...

✓ 9. ... ASSEMBLY ...

9. LOCK ...

10.

# AUTOMATIC MULTIPLICATION

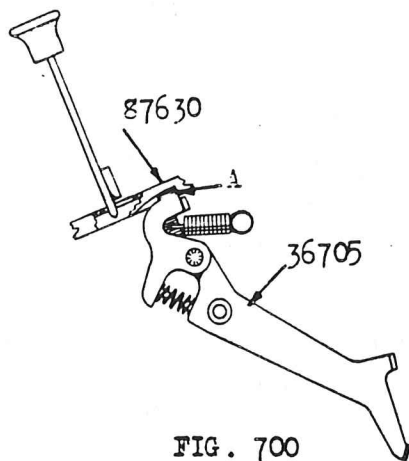


FIG. 700

1. Lock Bar 87630 is normally spring urged rearward by ear (A) of Lever 36705 to permit depression of a multiplier key. Fig. 700.

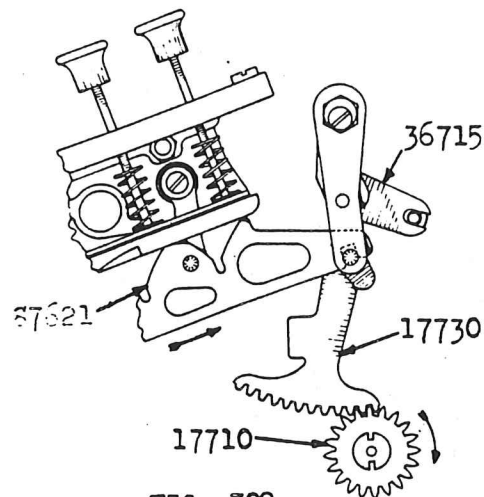


FIG. 702

## NO. 2 TO NO. 9 KEYS

3. Depression of any multiplier key from No. 2 to No. 9 inclusive causes Selection Bar 87621 to move to rear by a selective amount depending on the key depressed, thus rocking Bail 36715, to position Segment 17730 and locate Cam Assembly 17710 for the selection corresponding to the key depressed. Fig. 702.

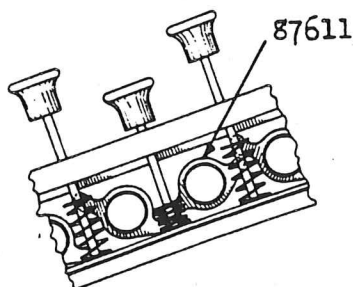


FIG. 701

2. Interlocks 87611 prevent depression of multiplier key on either side of depressed key by pressing upward against shoulders on keys. Fig. 701.

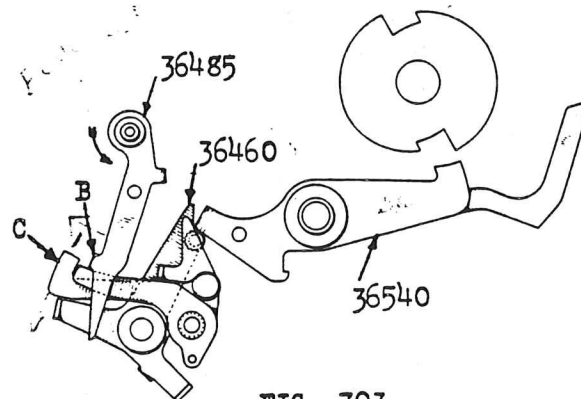
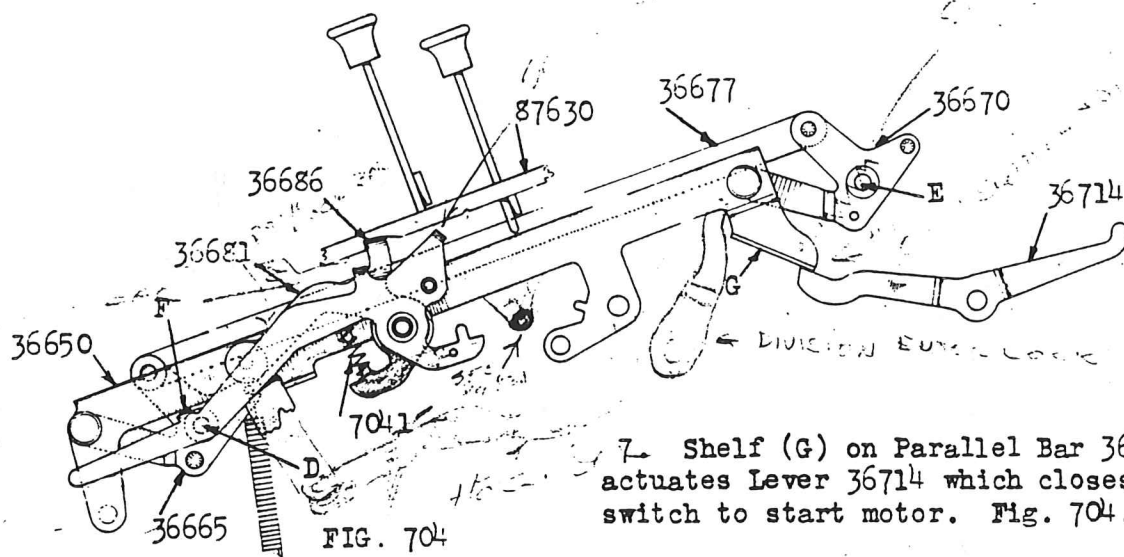


FIG. 703

4. Also Lever 36485 (which limits the machine to a single operation as described in paragraph 22, page 607) is rocked rearward to remove ear (B) from nose (C) so as to allow Roller Latch 36460 to latch Main Clutch Dog 36540. Fig. 703.



AUTOMATIC MULTIPLICATION . Cont'd

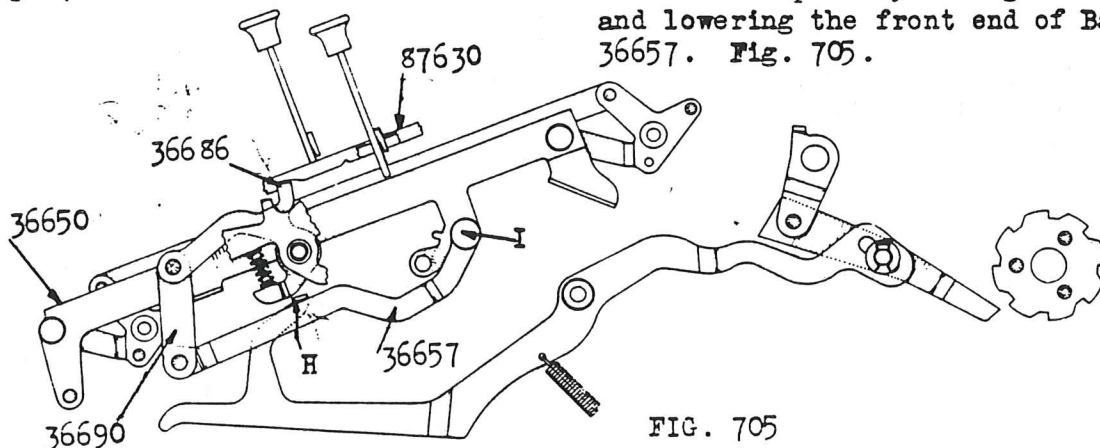


5. Parallel Bar 36650 is mounted on two parallel Links 36665 and 36670, which are also connected by Bar 36677 to prevent any see-saw motion in the parallel bar. The links are pivoted to the frame at (D) and (E). Fig. 704.

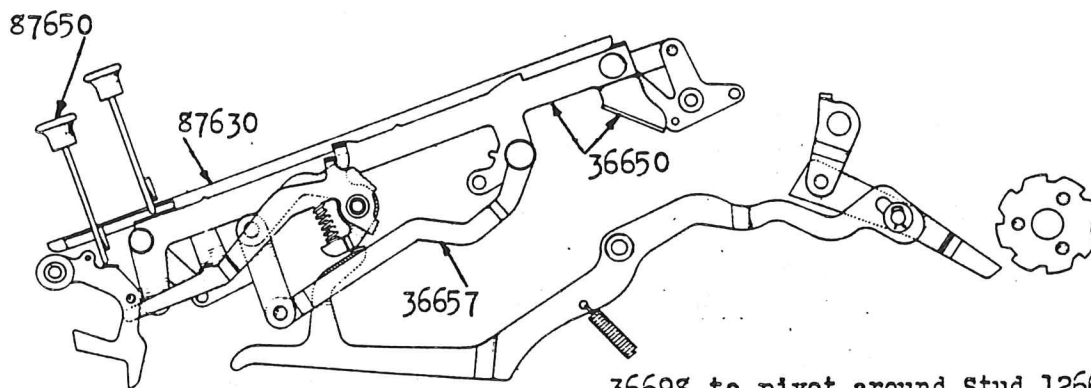
6. Upon depression of a multiplier key the keystem thereof contacts and forces the Parallel Bar 36650 downward thus pressing down ear (F) on Lever 36681. This lever through Spring 7041 actuates Lever 36686 to force Lock Bar 87630 forward, overcoming its normal spring urge rearward, and locking the depressed key down and the other keys up. Fig. 704.

7. Shelf (G) on Parallel Bar 36650 actuates Lever 36714 which closes switch to start motor. Fig. 704.

8. The starting of the machine is controlled by the lowering of ear (H) which is spring urged downward as far as the Bar 36657 will permit. The rear end of Bar 36657 is pivoted to Parallel Bar 36650 at (I) and lowered whenever that bar is depressed. The front end of Bar 36657 is connected by means of Link 36690 to Lever 36686 and is therefore lowered as Lock Bar 87630 moves forward. To permit ear (H) to drop low enough to start the machine, both ends of Bar 36657 must be completely lowered. This cannot be done without all keys, in the multiplier row, locked completely up or down, for if any key is partially depressed the lug on the key stem will prevent the lock bar from completely moving forward and lowering the front end of Bar 36657. Fig. 705.



**AUTOMATIC MULTIPLICATION . Cont'd**



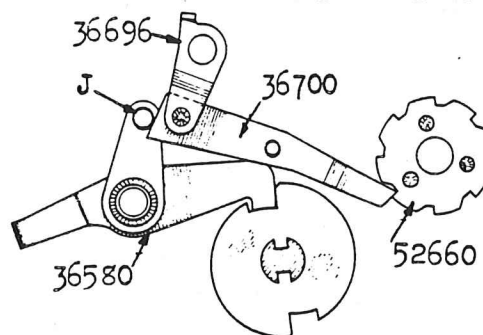
**FIG. 706**

9. When the Zero Key 87650 is depressed, the Lock Bar 87630 moves completely forward and lowers the front end of Bar 36657 but the zero key does not engage Parallel Bar 36650 and therefore does not lower the rear end of Bar 36657. Fig. 706.

10. Therefore the machine can only be started with a No. 1 to No. 9 Multiplier Key completely depressed and Lock Bar 87630 moved into place to lock it down, for only so will both ends of Bar 36657 be lowered. (Except by operation of the add and subtract bars. See page 617.)

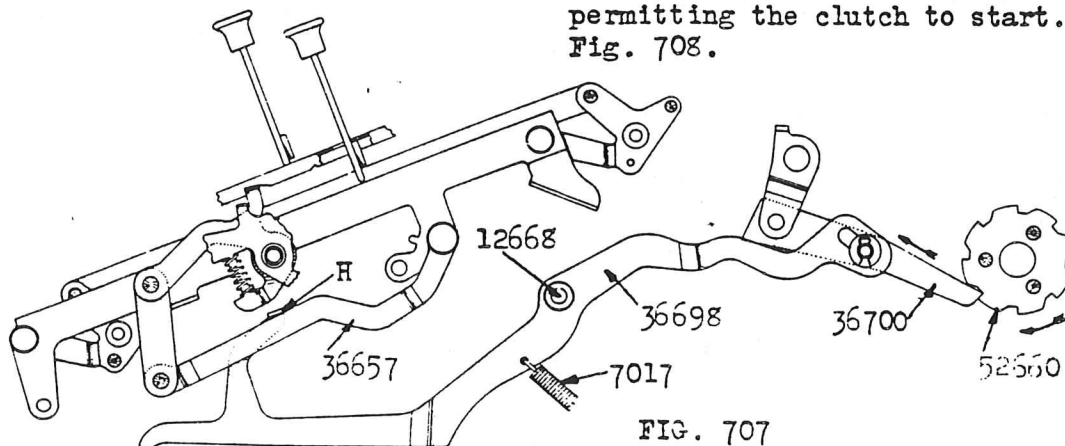
11. When both ends of Lever 36657 are lowered, ear (H) on Lever 36698 follows it downward allowing Lever

36698 to pivot around Stud 12668 under the tension of Spring 7017 and position the rear end of Lever 36700 into the path of Ratchet 52660, which is constantly rotating in the direction of arrow, so long as the motor is running. Fig. 707.



**FIG. 708**

12. Lever 36700, guided at its forward end by Link 36696 and at its center point by the slot in Lever 36698, is driven forward by Ratchet 52660 against Stud (J) of the Setting Clutch Dog 36580, withdrawing the dog from the setting clutch thus permitting the clutch to start. Fig. 708.



**FIG. 707**



By holding the lever on entire wheel  
 single wheel latch. Hold lock bar until parallel is restored and  
 release build up spring pressure

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# AUTOMATIC MULTIPLICATION . Cont'd

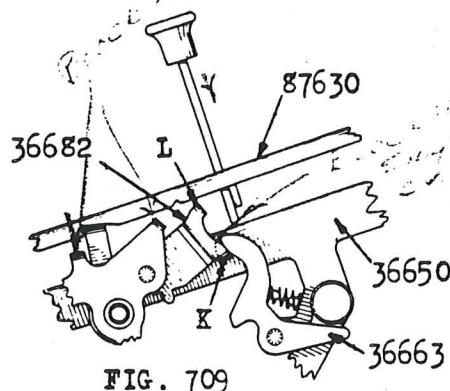


FIG. 709

13. As Parallel Bar 36650 is lowered, Hook 36663 hooks ear (K) of Lever 36682, lowering rear end thereof and preventing ear (L) from engaging notch in Lock Bar 87630. Fig. 709.

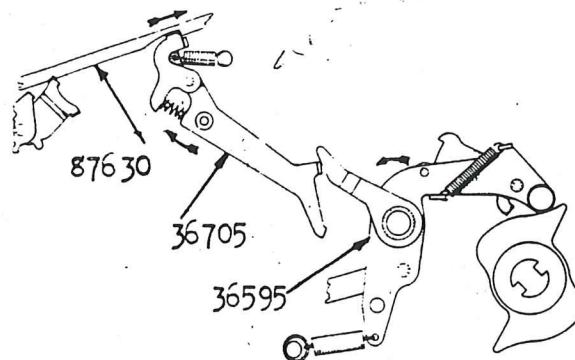


FIG. 711

15. Late in the setting clutch cycle, after the multiplier selection has been made, the Lock Bar 87630 is forced rearward by Lever 36595 actuating Lever 36705. Fig. 711.

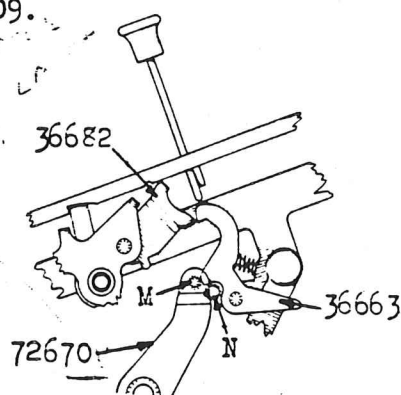


FIG. 710

14. When the Carriage dips, Lever 72670 is rocked so as to move stud (M) to position (N), releasing Hook 36663 and allowing Lever 36682 to rest against lock bar. Fig. 710.

16. This rearward movement of Lock Bar 87630 rocks Lever 36686 upward, raising the front end of Bar 36657 and ear (H) on Lever 36698. ~~thereby lowering the rear end of Lever 36698 and withdrawing Lever 36700 from Ratchet 52660.~~ Fig. 712.

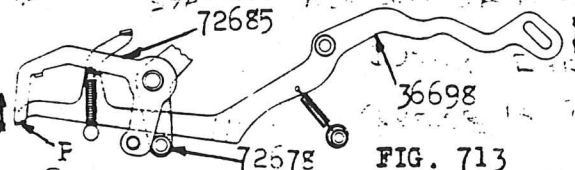


FIG. 713

17. Upon dipping of the carriage, Lever 36698 is held out of operation by ear (P) on Lever 72685, Fig. 713, which is rocked upward by Stud 72678. (paragraph 11, page 615).

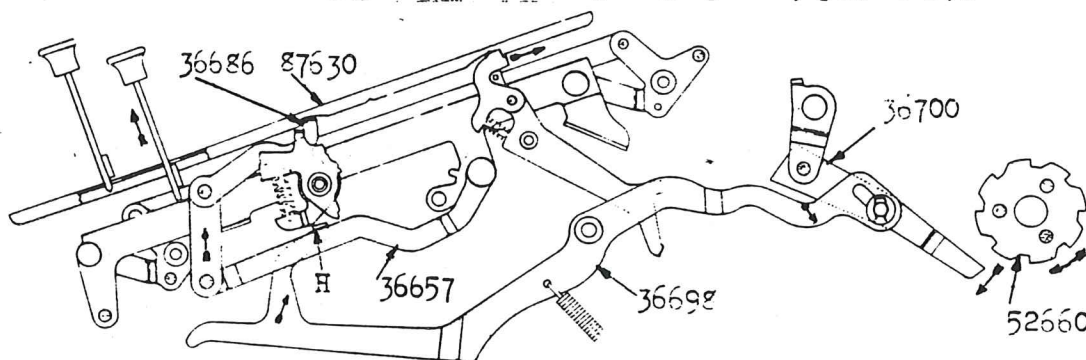


FIG. 712

**AUTOMATIC MULTIPLICATION . Cont'd**

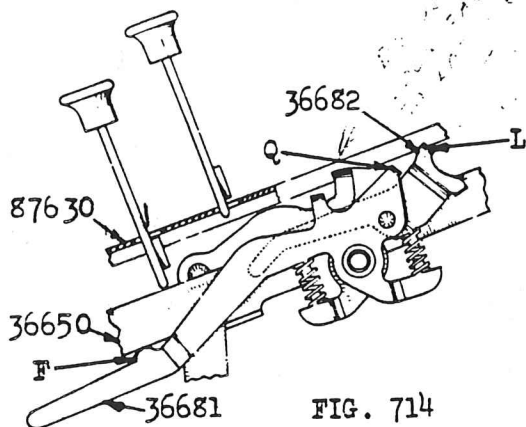


FIG. 714

18. If key is still being held depressed when Lock Bar 87630 is cocked back, ear (L) on Lever 36682 engages notch in Lock Bar 87630, preventing the lock bar from returning forward and relocking the depressed key. As pressure on the depressed key is released, Parallel Bar 36650 is permitted to rise, releasing ear (F) of Lever 36681, which follows the parallel bar upward, and lowers ear (Q) to force 36682 out of its notch in Lock Bar 87630, thus releasing the lock bar for a new operation. Fig. 714.

19. If while one multiplication operation is going on the operator depresses a second key, Lock Bar 87630 will lock that key down and all others up until Lever 36705 retracts Lock Bar 87630. Fig. 711.

20. If the operator is then riding a third key the lock bar will let the second key up and the third key down at almost the same instant, during the cocking back of Lock Bar 87630. With the normal light spring pressure raising the depressed key, the operator might easily be able to depress the new key so rapidly as to lower the Parallel Bar 36650 again before it rose high enough for Hook 36663 to engage ear (K), Fig. 709, in which case as the cocking back of the Lock Bar 87630 is completed and it is let forward again Lever 36682

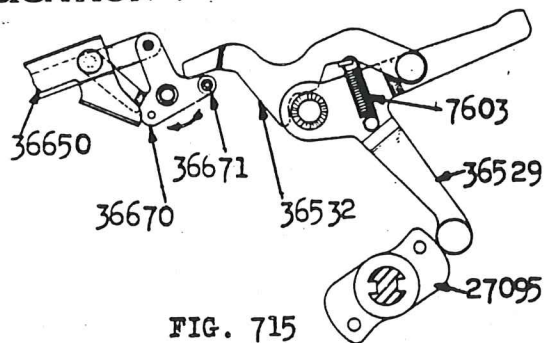


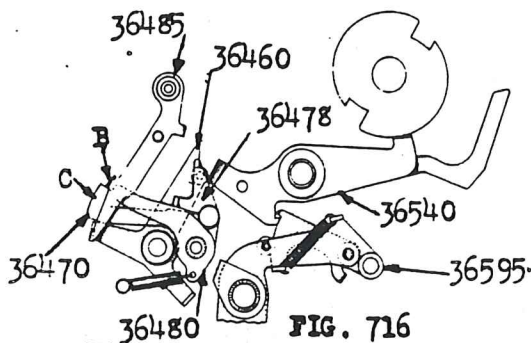
FIG. 715

would prevent the Lock Bar from returning and starting the machine just as though the original key was still being held depressed. In order to insure that any released key will get up so promptly as to avoid this difficulty if a quick interchange of keys is made just as the lock bar is being cocked back, the following arrangement is provided for applying an especially strong upward pressure on the Parallel Bar 36650 during the time Lock Bar 87630 is being cocked back. During this particular portion of the setting clutch cycle, Cam 27095 rocks Follower 36529 upward just as it does the similar Follower 37530 on the Model "D". There is however, pivoted to Follower 36529, a Lever 36532 pulled downward by Spring 7603 so that as Follower 36529 is rocked upward it will press downward on Roller 36671, making its strong pressure available to tend to rock Link 36670 in the direction of arrow and to raise Parallel Bar 36650. Fig. 715.

21. The setting line sets in the selection in accordance with the depressed multiplier key as described under Trip Unit Selection, page 610; and starts the main clutch, and product dials are continuously driven until the trip unit forces Roller Latch 36460 from under Main Clutch Dog 36540, paragraph 4, 5 and 6, page 611 and 612. The dog stops the main clutch and starts a restore cycle and shift.



**AUTOMATIC MULTIPLICATION . Cont'd**

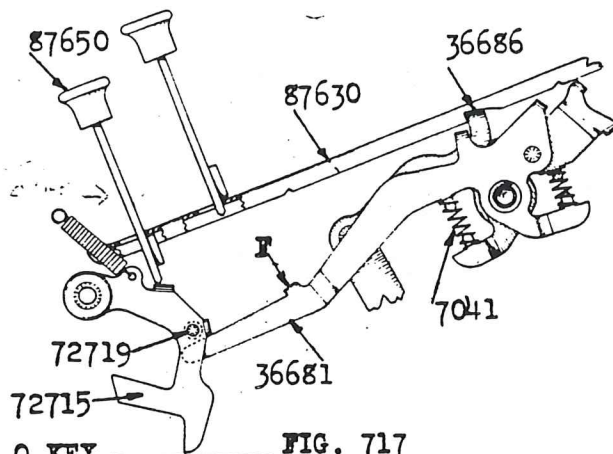


**FIG. 716**

**NO. 1 KEY**

22. The No. 1 Multiplier Key does not contact Selection Bar 87621 and the trip unit does not function. The action otherwise is the same as the other multiplier keys. A single cycle of operation is obtained due to ear (B) of Lever 36485 overlying nose (C) of Lever 36470, thus blocking Roller Latch 36460 from seating under Main Clutch Dog 36540. Fig. 716.

23. If a higher multiplier key were depressed as soon as Lock Bar 87630 is retracted far enough to permit of such depression, Main Clutch Dog 36540 would be in the process of being raised by Starting Arm 36595. Depression of the higher multiplier key would move ear (B) of Lever 36485 away from nose (C) of Lever 36470 thus permitting Roller Latch 36460 to latch under Main Clutch Dog 36540 and leave the clutch running continuously. To prevent this possibility Lever 36480 is permitted to rock in back of ear (B) as the Main Clutch Dog is raised, thus blocking rearward movement of ear (B) until Dog 36540 dropping down again hits tip 36478 and cams Lever 36480 into the clear, when it will be too late for the Roller Latch 36460 get under Dog 36540. Fig. 716.

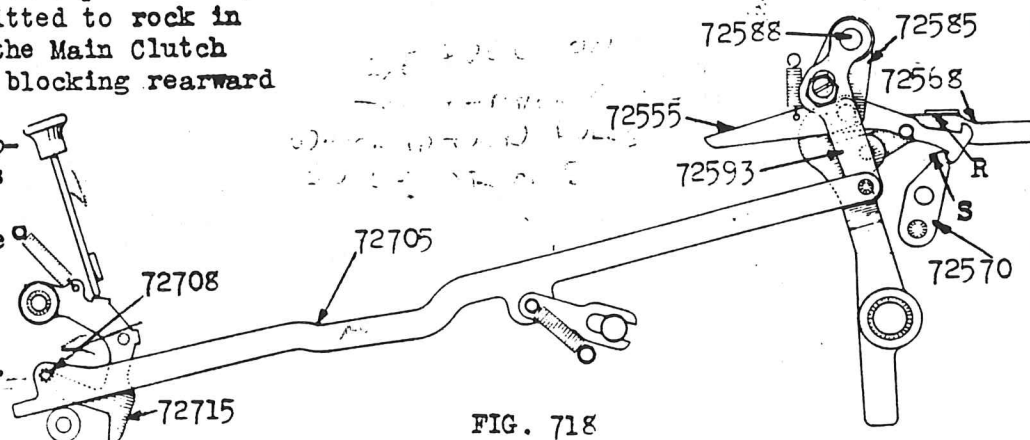


**FIG. 717**

**O KEY**

24. Depression of the Zero Key 87650 forces Lever 72715 down. Stud 72719 on Lever 72715 contacts Lever 36681 which through Spring 7041 and Lever 36686 forces Lock Bar 87630 forward to lock Key 87650 down and other keys up. Fig. 717.

25. The lower end of Lever 72715 contacts Stud 72708 on Link 72705 resulting in the forward movement thereof together with Lever 72555 through action of Lever 72593, Shaft 72588 and Lever 72585. Lever 72555 engages shelf (R) on Link 72568 thereby giving a left shift when moved forward, or ear (S) on Lever 72570 thereby giving a right shift when moved forward, depending on which shift control key is depressed. Fig. 718. See Shift, paragraph 2, page 613.



**FIG. 718**

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## AUTOMATIC MULTIPLICATION . Cont'd

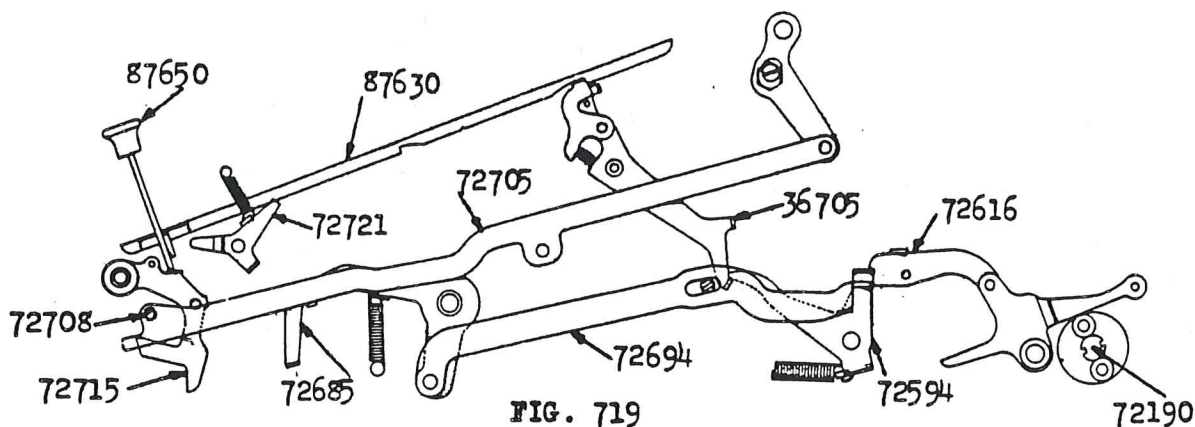


FIG. 719

26. As Shift Jack Shaft 72190 rotates, Release Link 72616 contacts left ear of Bail 72594 while right ear thereof actuates Link 72694 and Lever 36705. Lever 36705 forces Lock Bar 87630 rearward to release Zero Key 87650. Latch 72721 holds Lock Bar 87630 rearward until zero key rises and kicks Latch 72721 out. Fig. 719

27. Link 72694 rocks Lever 72685 upward to force Stud 72708 on Link 72705 from in front of Lever 72715 allowing shift mechanism to return to neutral position. Fig. 719.

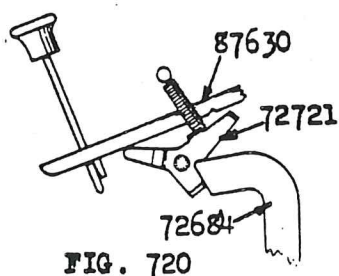


FIG. 720

28. If a multiplier key is depressed followed very quickly with a depression of the zero key, the Lock Bar 87630 would be held rearward by Latch 72721 and the zero key would not be latched down by the lock bar. To avoid this condition Latch 72721 is held out by Link 72684 during carriage dip. Fig. 720.

29. While the zero shift must cock back Lock Bar 87630, as described in paragraph 26, the automatic shift following the operation of a No. 1 to No. 9 Multiplier Key must not do so, or a second key, latched down while the first key is operating, would be released before the selection could be taken from it. We therefore make use of the fact that during an automatic shift following the operation of a No. 1 to No. 9 Multiplier Key the rear end of Lever 72551 is raised up to be engaged by ear (T) of Lever 27145, while during all other shifts it underlies ear (T). During the automatic shift Release Link 72616 does not contact Bail 72594, it being raised out of the path of the bail by Release Control 72595 which follows Lever 72551 up, Fig. 721, but during all other shifts it is lowered down to contact the bail as in Fig. 719.

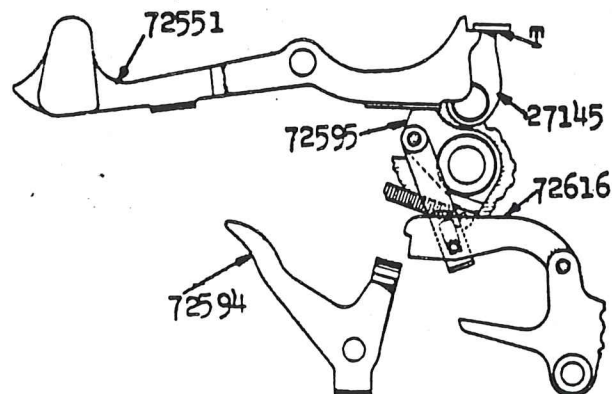


FIG. 721



# MARCHANT

## AUTOMATIC MULTIPLICATION . Cont'd

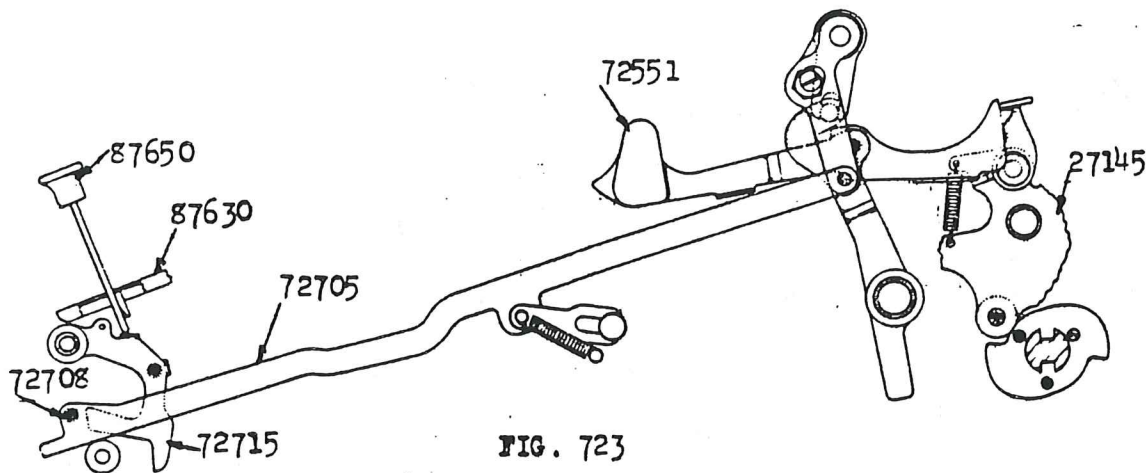


FIG. 723

30. When a multiplier key is depressed followed at once by a depression of the zero key, a double shift is obtained, consisting of the usual automatic shift following multiplication, during which the Zero Key 87650 remains latched down by Lock Bar 87630, and a shift off of the zero key. Fig. 723.

32. As the carriage rises Lever 27145 forces Lever 72551 forward so as to cause an automatic shift. This also results in a forward movement of Link 72705 and dropping of stud 72708 in front of Lever 72715 due to lowering of Lever 72685 by the carriage rise. Fig. 723. During this automatic shift, Link 72616 overrides and misses Bail 72594 as shown in Fig. 721.

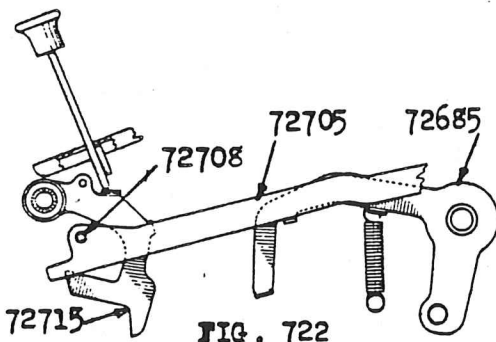


FIG. 722

31. Under these circumstances the zero key is depressed while the carriage is dipped, and Stud 72708 on Link 72705 is raised from in front of Lever 72715 by the carriage dip acting through Lever 72685. Fig. 722.

33. Near the close of the automatic shift, Bell Crank 72235 forces Lever 72551 from engagement with ear (T) of Lever 27145 which action lowers Release Control 72595 so that Link 72616 contacts Bail 72594 during the next shift cycle, thus cocking back Lock Bar 87630 to release the zero key and kicking Lever 72705 out of engagement with Lever 72715. This allows the shift to centralize to neutral. Fig. 724.

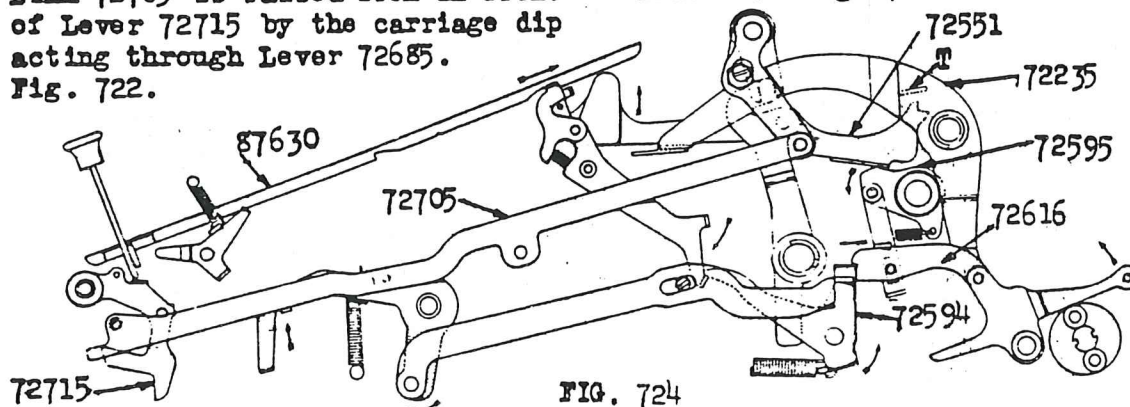


FIG. 724

TRIP UNIT SELECTION

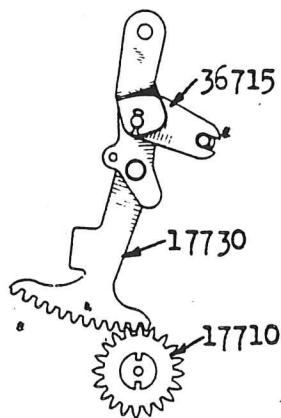


FIG. 735

1. Selection Cam Assembly 17710 is positioned by Segment 17730 and Bail 36715 as described in paragraph 3, page 602, Automatic Multiplication. Fig. 735.

2. Lock Gate 27045 and Feeler Assemblies 17065 and 17080 operate in same manner as in other selections. Fig. 736.

3. Selection Levers (U) of Trip Unit are moved forward to select 6, 7, 8, and 9 and are moved rearward to select 5, 4, 3, and 2.

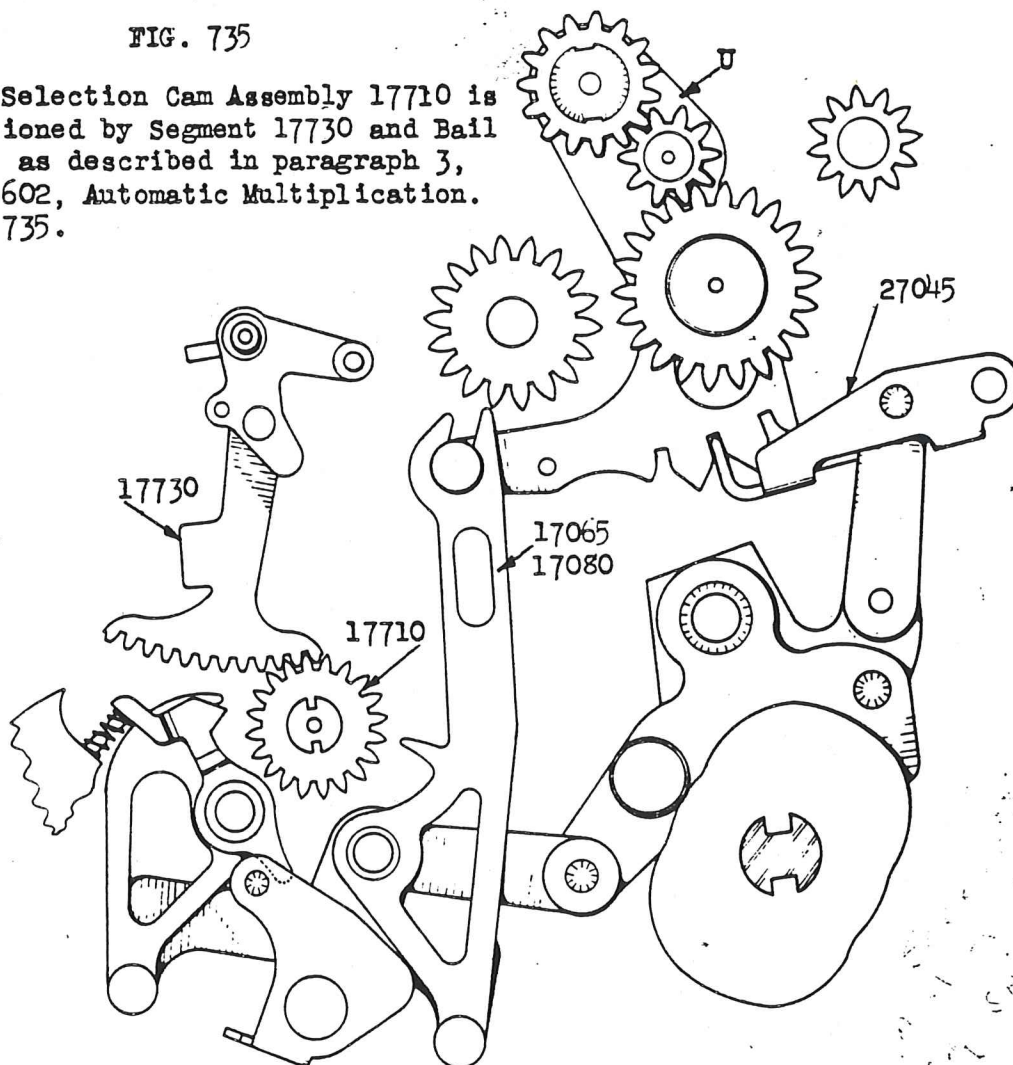


FIG. 736



## TRIP UNIT

1. The Trip Unit is located in the extreme right section of the actuator unit and its purpose is to control the number of actuations of the Main Clutch during multiplication.

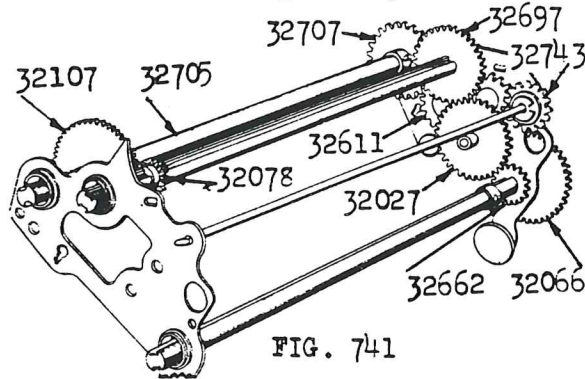


FIG. 741

2. Twelfth Turn Shaft 32705 is driven one twelfth turn per cycle through the train of Gears 32066, 32662, 32027, 32697, 32078 and 32107 just as in the Model "D". 24 Tooth Gear 32707 pinned to twelfth turn shaft drives through two Idlers 32611, supported on Actuator Right Frame 32610, to Gear 32743 of Multiplier Pivot Gear Assembly 32735 uniformly advancing it two teeth per cycle. Fig. 741.

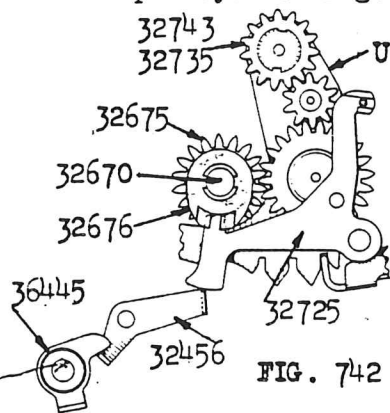


FIG. 742

3. No. 6 to 9 Gear Assembly 32675 is free on Half Turn Shaft 32670. It includes a 12, a 14, a 16 and an 18 tooth gear, for handling the 6, 7, 8 and 9 selections respectively. Upon depression of a 6, 7, 8 or 9 Multiplier Key, the corresponding Selection Plate (U) is rocked forward to connect the respective gear

of the No. 6 to 9 Gear Assembly 32675 up with the Pivot Gear 32743 through the idler gears on the selection plate. This will result in No. 6 to 9 Assembly 32675 being driven two teeth per cycle, the same as Pivot Gear Assembly 32735 is driven. If meshed with the 12 tooth gear it will be driven through a complete revolution in 6 cycles; if meshed with the 14 tooth gear in 7 cycles, etc. Fig. 742.

4. Trip Lever 32725 normally rests in a notch in Trip Cam 32676 on No. 6 to 9 Assembly 32675, the sides of the notch being so bevelled that as Assembly 32675 is driven out of its "home" position in either direction it will cam Lever 32725 to one side, but not rock it downward. When the cam is about half way around however, Lever 32725 is free to move back over the surface of the cam so that just before it reaches its "home" position again it cams Trip Lever 32725 downward, rocking Lever 36456, and through it, rocking Main Clutch Latch Assembly 36445, which rocks Roller Latch 36460 from under Main Clutch Dog 36540 (see Fig. 703, page 602) thus stopping the machine as Cam 32676 completes its full turn. Fig. 742.

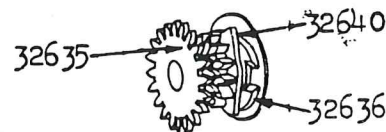


FIG. 743

5. No 2 to 5 Gear Assembly 32635 is free on Quarter Turn Shaft 32700, and consists of two parts. One of them is the No. 3 to 5 Assembly which includes a 20, a 16, and a 12 tooth gear at the left of the assembly for handling the 5, 4 and 3 selections respectively and Trip Cam 32636 at the right of the assembly. The other is the No. 2 Trip Cam and

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## TRIP UNIT . Cont'd

Gear Assembly 32640 which is free on the hub of the No. 3 to 5 Assembly and located between the No. 3 to 5 Gears and the Trip Cam. Fig. 743.

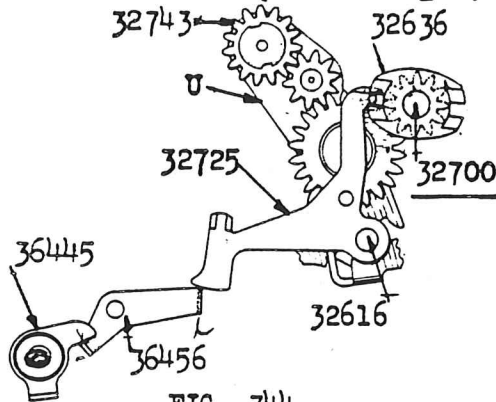


FIG. 744

6. Upon depression of a 3, 4, or 5 Multiplier Key the corresponding Selection Plate (U) is rocked rearward to connect the respective gear of the No. 3 to 5 Assembly with Pivot Gear 32743 through the idler gears on the Selection Plate. The No. 3 to 5 Assembly will thus be driven two teeth per cycle so that if meshed with the 20 tooth gear it will take 5 cycles to drive one half turn, if with the 16 tooth gear 4 cycles, etc. Cam 32636 has two "home" positions arranged to cam Trip Lever 32725 sidewise in starting either direction out of either one, but to rock it forward about Stud 32616 as it approaches either "home" position, so as to rock Lever 36456 downward thus rocking Main Clutch Latch Assembly 36445 and stopping the machine as Cam 32636 completes a half turn. Fig. 744.

7. Upon depression of the No. 2 Multiplier Key, the corresponding Selection Plate (U) is rocked rearward to connect the 12 tooth gear in Trip Cam and Gear Assembly 32640 up with the Pivot Gear 32743 through the idler gears on the selection plate. This will result in Trip Cam and Gear Assembly 32640 being driven

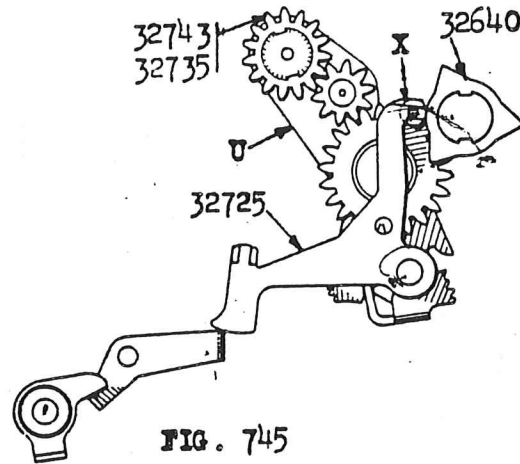


FIG. 745

two teeth per cycle, the same as Pivot Gear Assembly 32735 is driven. Cam 32640 is thus driven one third of a revolution in two cycles during which one of the rises on the three lobe cam contacts roller (X) on Trip Lever 32725 to stop machine. Fig. 745.

8. When No. 6 to 9 Gear Assembly 32675 is not being driven it is held in its neutral position by Pawl 32745 acting on Centralizer Cam 32686 of the 32675 Assembly. Fig. 746.

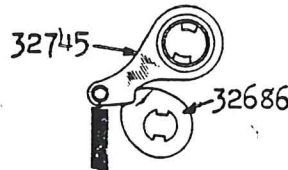


FIG. 746

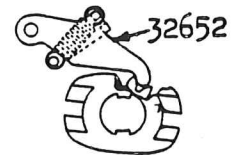


FIG. 747

9. No. 3 to 5 Assembly when not being driven is held in its neutral position by Pawl 32652, pawling into the 12 tooth No. 3 Gear. Fig. 747.

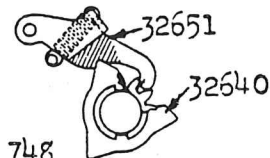


FIG. 748

10. No. 2 Gear and Cam 32640 are held in neutral position by Pawl 32651, pawling into gear. Fig. 748.



# MARCHANT

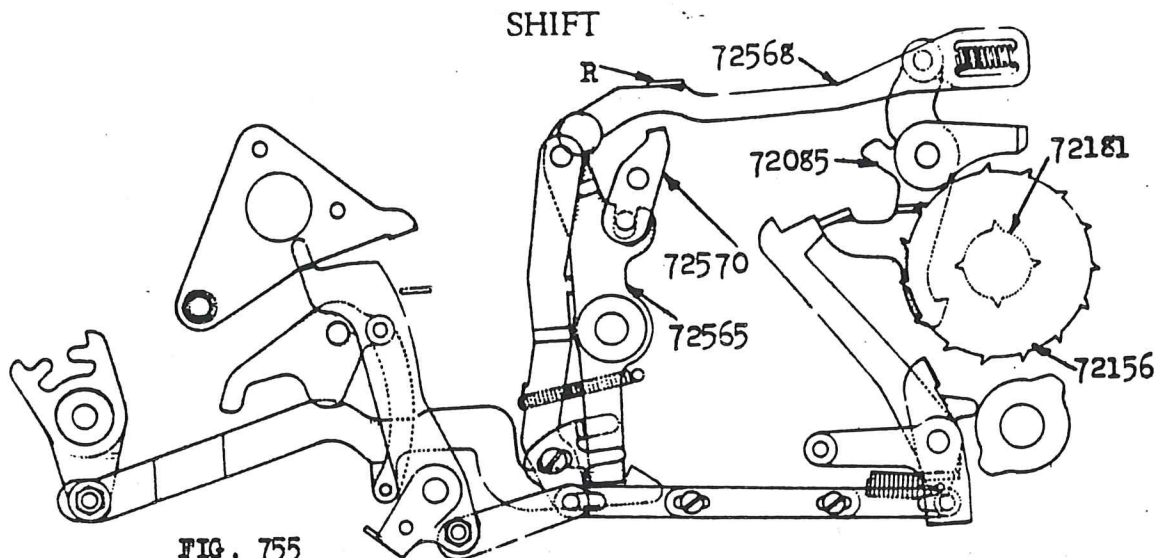


FIG. 755

1. The Shift in the Model "M" operates in the same general manner as in the Model "D"; forward movement of Link 72568 rocking Bell Crank 72085 to engage Ratchet 72181 producing a left shift, while rearward movement of Link 72568 rocks Bell Crank 72085 to engage Ratchet 72156 giving a right shift. Manual operation is identical in both machines. Fig. 755.

Lever 72545, is also moved forward. Fig. 756. If Lever 72555 has its rear end raised, engaging ear (R) it will pull Link 72568 forward causing a left shift. If Lever 72555 has its rear end lowered it will pull Lever 72570 forward which in turn will force Lever 72565 and Link 72568 rearward to cause a right shift. Fig. 755.

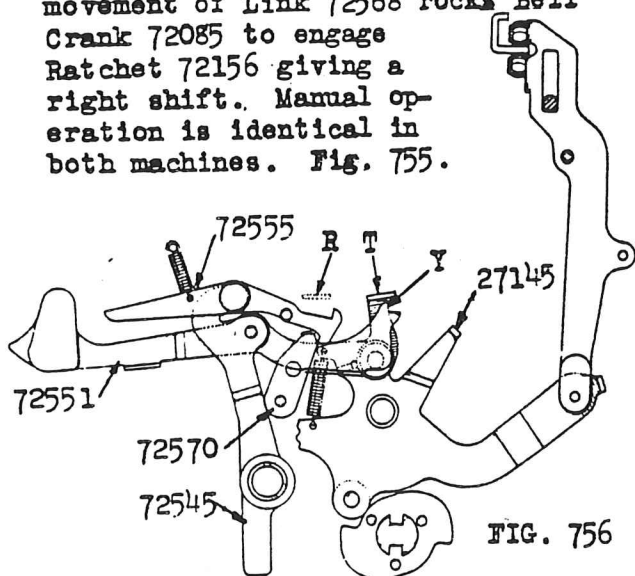


FIG. 756

2. Automatic Shift is started, in the same way as in the Model "D". When the main clutch is stopped a restore clutch operation automatically follows which raises the carriage, rocking ear (T) on Lever 27145 forward so to engage nose (Y) of Lever 72551 forcing it forward along with Lever 72545 to which it is pivoted. Lever 72555, pivoted to

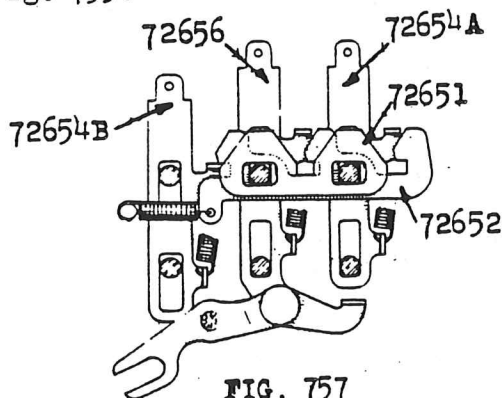


FIG. 757

3. The shift in automatic multiplication in the Model "M" can be set, by the depression of one of three keys, to the right, non-shift, or left. Depression of any shift control key cams the Bar 72652 to the rear releasing other depressed shift control key and then the bar moves forward to lock down the depressed key. Bar 72651 permits but one key to be depressed at a time. Fig. 757.

## SHIFT . Cont'd

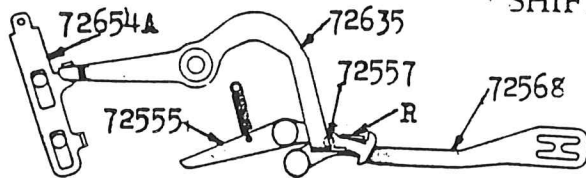


FIG. 758

4. Depression of upper Shift Control Key 72654A rocks Lever 72635 which in turn engages Stud 72557 on Lever 72555 and rocks the lever upward to engage ear (R) on Link 72568 so that when Lever 72555 is moved forward by the carriage rise it will pull Link 72568 forward thus giving a left shift. Fig. 758.

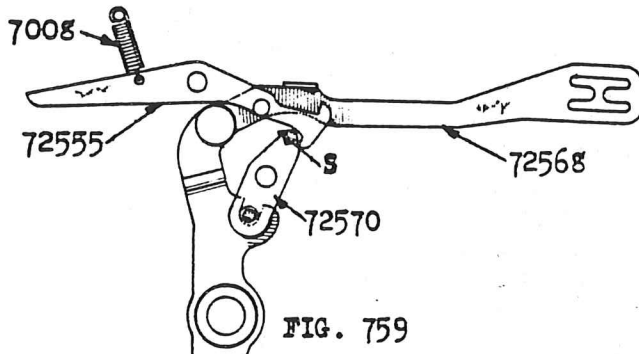


FIG. 759

5. Depression of lower Shift Control Key 72654B releases other shift control key which may be depressed. Lever 72555 is then pulled to lower position by Spring 7008 where it engages ear (S) of Lever 72570, so that when Lever 72555 is moved forward by the carriage rise it will pull ear (S) forward, thereby forcing Link 72568 rearward thus giving a right shift. Fig. 759.

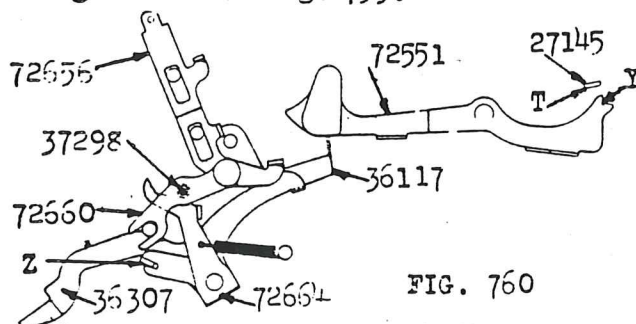


FIG. 760

6. Depression of Non-Shift Key 72656 lowers rear end of Lever 72660, Stud 37298 of which contacts

diagonal surface of Bail 72664 forcing upper end of bail forward. Bail 72664 has a slot which engages ear (Z) on Lever 36307 forcing that lever to rock so as to raise Lever 36117 and through it rock Lever 72551 so as to lower nose (Y) thereof from path of ear (T) on Lever 27145. Fig. 760.

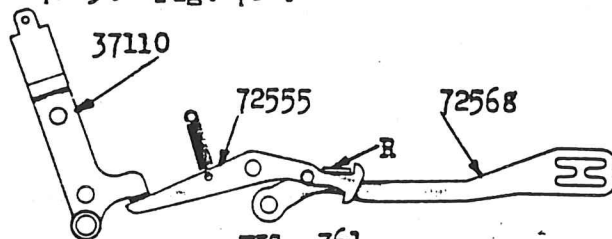


FIG. 761

7. Depression of Division Key 37110 positions Lever 72555 to engage ear (R) on Link 72568 and give left shift regardless of the shift control key depressed. Fig. 761.

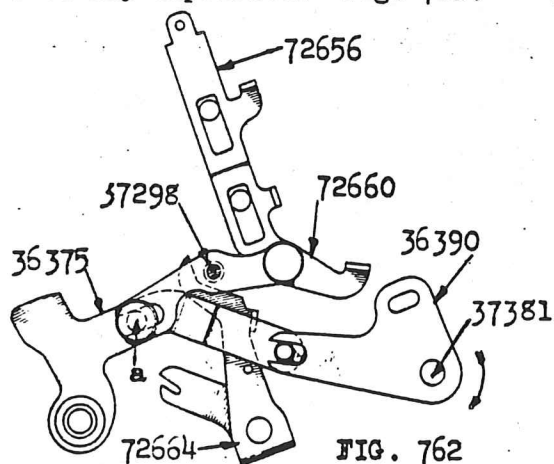


FIG. 762

8. Depression of Division Key 37110, which rocks Shaft 37381 in the direction of arrow the same as on the Model "D", rocks Lever 36390 which in turn rocks Lever 36375 upward. Stud (a) on Lever 37375 raises front end of Lever 72660 thus raising Stud 37298. If Non-Shift Key 72656 is down, the above action raises Stud 37298 away from Bail 72664 thus permitting return of the non-shift mechanism to normal shift position. Fig. 762.



# MARCHANT

SHIFT . Cont'd

9. As division is stopped, with non-shift key down, either in the last position or by use of stop key, the carriage will not shift out of the last order in which operated, because the letting up of the division key will lower the front end of Lever 72660, and Stud 37298 will rock Bail 72664 into the non-shift position again. Fig. 762.

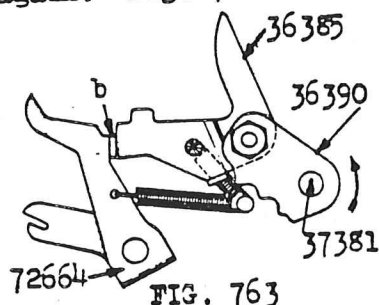


FIG. 763

10. If non-shift key is up as division key is released a shift out of the last order in which operated is prevented as follows: The letting up of the division key rocks Shaft 37381 and Lever 36390 in the direction of arrow. Latch 36385, pivoted to Lever 36390, contacts ear (b) on Bail 72664 thus rocking bail to its non-shift position. Fig. 763.

11. When the carriage dips, Link 72701 rocks Link 72684 and Stud 72678 on Lever 72665 forward, which in turn rocks Latch 72683 downward to underlie ear (c) on Latch 36385. Upon rising of carriage, Latch 72683 kicks out Latch 36385 releasing shift mechanism to neutral. Fig. 764.

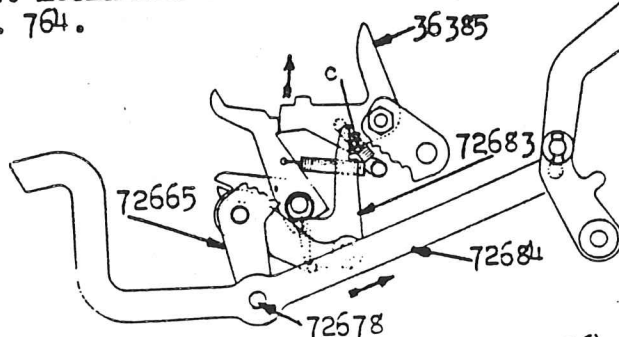


FIG. 764

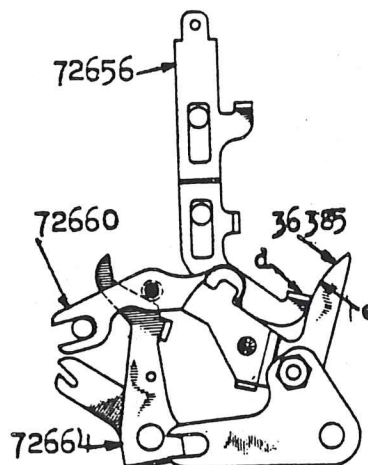


FIG. 765

12. In order that Latch 36385 will not drop in behind ear (b) on Bail 72664 and prevent its return to normal shift position in case the non-shift key is depressed and then let up again without operating the machine, ear (d) on Lever 72660 engages tail (e) of Latch 36385 when the Non-Shift Key 72656 is depressed and prevents Latch 36385 from functioning until the non-shift key has been let up. Fig. 765.

SHORT CUT KEY

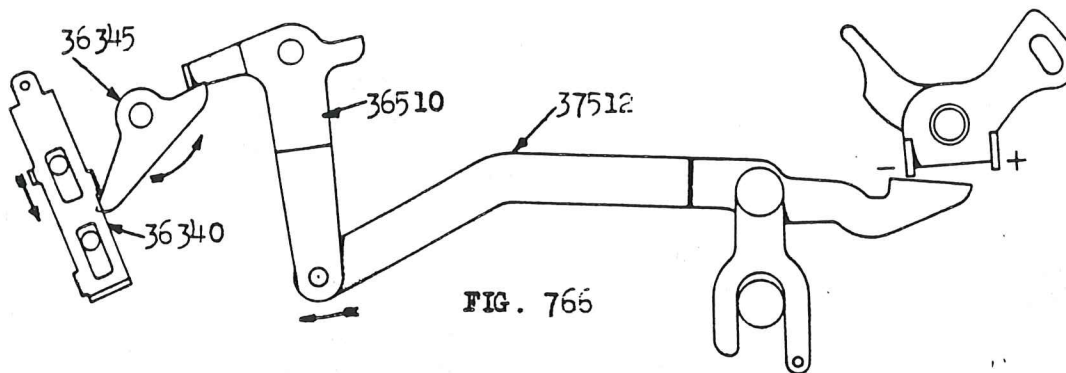


FIG. 765

1. Depression of the Short Cut Key 36340 causes Lever 36345 to rock Lever 36510 and pull Link 37512 forward to negative position. Fig. 766

Levers 36360 and 36335. A second Latch 36330 engages Latch 36370 holding it away from Key 36340 until the key is released by operator. Fig. 768

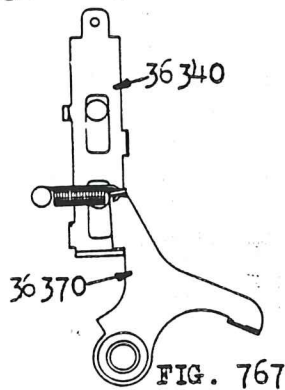


FIG. 767

2. Key 36340 is latched down by Latch 36370. Fig. 767

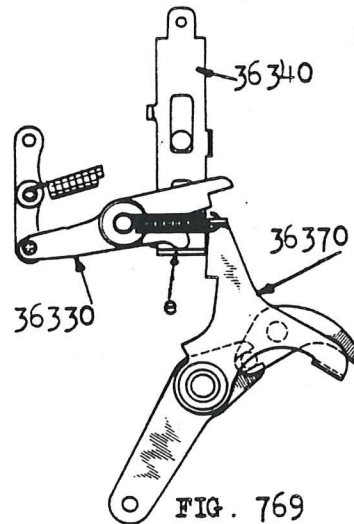


FIG. 769

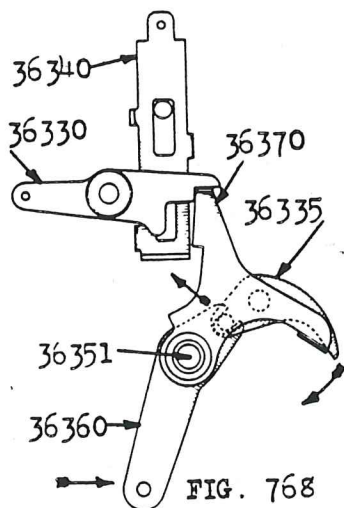


FIG. 768

3. Upon a setting clutch operation, Shaft 36351 rocks and disengages Latch 36370 through the action of

4. When key is let up by operator ear (e) on Key 36340 engages Latch 36330 and rocks it up to free Latch 36370 and all parts are returned to initial positions by spring tension. Fig. 769



ADDITION AND SUBTRACTION

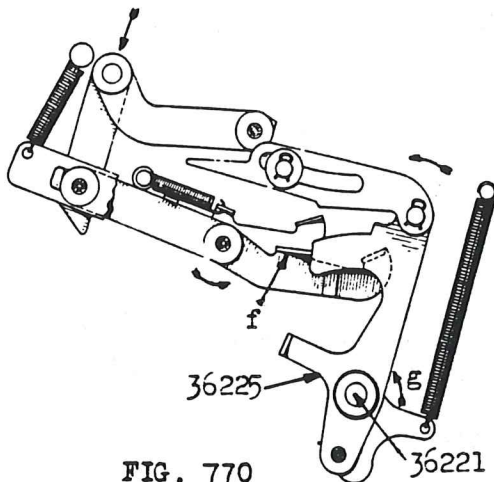


FIG. 770  
VIEW FROM LEFT

ADD BAR

1. Depression of the add bar raises the ear (f) from the path of Lever 36225 allowing it to rock rearward in the direction of the arrow (g). Fig. 770.

2. Lever 36225 rocks Lever 36240 in the direction of arrow (h) through connection of Shaft 36221.

Lever 36240 contacts Stud 72708 on Link 36665, which supports the forward end of Parallel Bar 36650 rocking it down about Stud 36186 on which it is pivoted. Fig. 771.

3. This lowers Parallel Bar 36650 which causes Lock Bar 87630 to move forward and the setting clutch to start as described under Automatic Multiplication, paragraphs 8 to 12, pages 603-604.

4. The machine is normally limited to a single cycle of operation by the means described under Automatic Multiplication, paragraph 22, page 607. If however, a higher numbered multiplier key is depressed simultaneously with the add bar it will run for the corresponding number of cycles, the depression of the multiplier key disabling the single cycle control as described under Automatic Multiplication, paragraph 4, page 602.

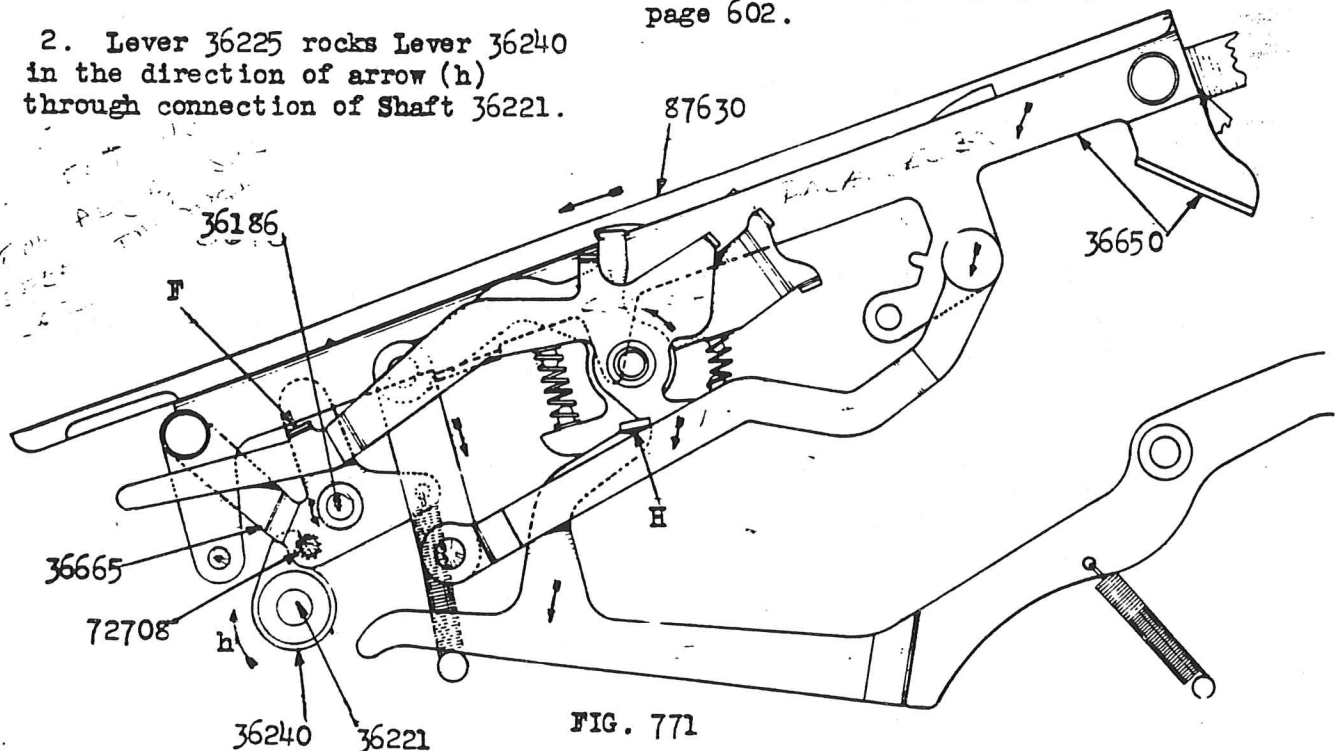


FIG. 771

ADDITION AND SUBTRACTION . Cont'd

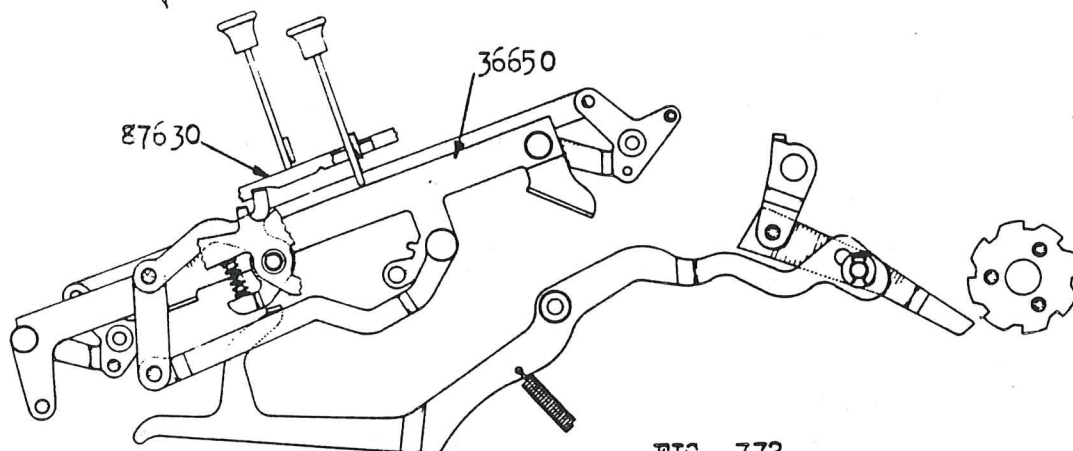


FIG. 772

5. Operation by depression of the add bar with a multiplier key partially depressed is prevented since as described under Automatic Multiplication, paragraph 8, page 603, depression of Parallel Bar 36650 can only start the machine if accompanied by forward movement of Lock Bar 87630, which is prevented by the lug on the key stem of any partially depressed multiplier key. Fig. 772.

AUTOMATIC KEY RELEASE

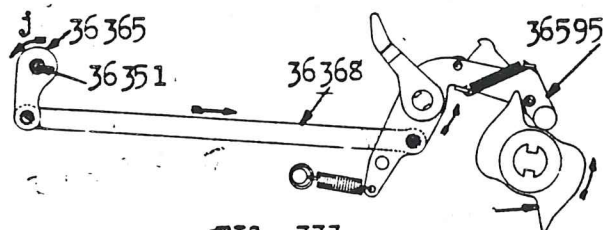


FIG. 773

6. The Starting Cam 27085 rocks Starting Arm 36595 which pulls Link 36368 and thereby rocks Lever 36365 and Shaft 36351 in the direction of arrow (j). Fig. 773.

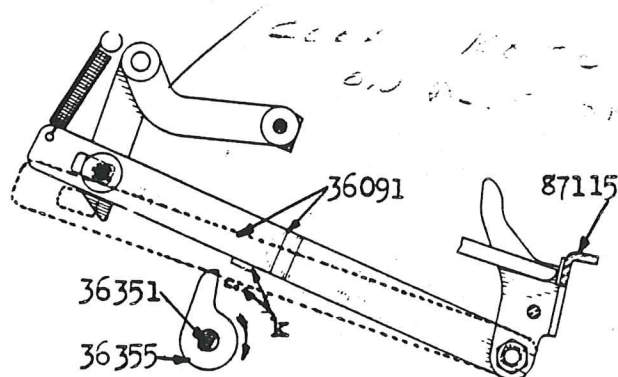


FIG. 774  
VIEW FROM LEFT

7. When the add bar is depressed, Link 36091 is lowered into the position shown by dotted lines in Fig. 774. Therefore when Cam 27085 rocks Shaft 36351, it in turn rocks Lever 36355 forward to contact ear (k) on Link 36091 thereby pushing it forward and rocking Gate 87115 which releases depressed keys in keyboard. Fig. 774.



ADDITION AND SUBTRACTION . Cont'd

RECOCKING OF OPERATING LEVER

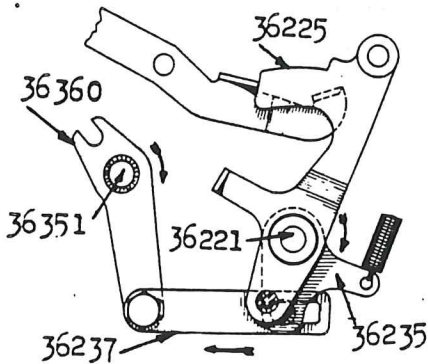


FIG. 775  
VIEW FROM LEFT

8. Shaft 36351 also rocks Lever 36360 and Link 36237 rearward. Link 36237 rocks Shaft 36221 through Lever 36235 thus recocking Lever 36225. Fig. 775.

9. If add bar is still held depressed at this time, ear (l) on Lever 36096 is spring pulled into the path of Link 36228 thus holding Lever 36225 from returning rearward when the recocking is finished. Fig. 776.

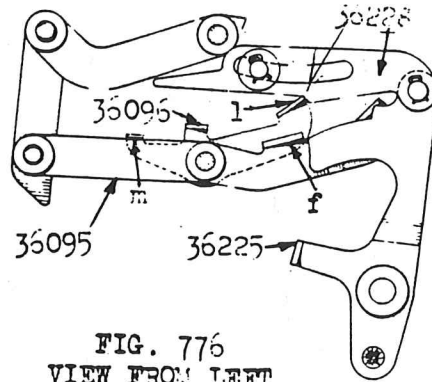


FIG. 776  
VIEW FROM LEFT

10. However, when the add bar is let up, Link 36095 in raising engages ear (m) of Lever 36095 thereby pulling ear (l) away from Link 36228, but not until ear (f) of Link 36095 has dropped into a position to block Lever 36225. Fig. 776.

NON SHIFT CONTROL

11. The shift is disabled by ear (n) on Lever 36225 lowering the front end of Lever 36307 which in turn through Lever 36117 lowers nose (Y) of Lever 72551 from path of ear (T) on Lever 27145. Fig. 777.

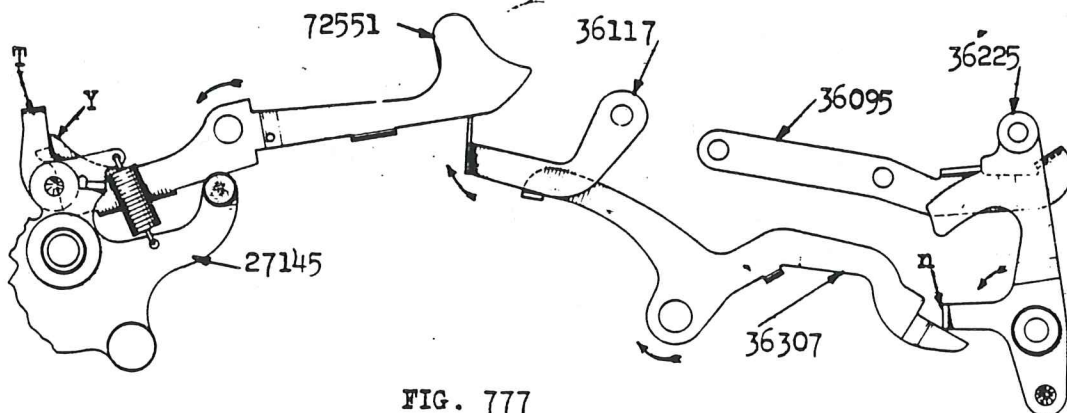


FIG. 777  
VIEW FROM LEFT

ADDITION AND SUBTRACTION . Cont'd

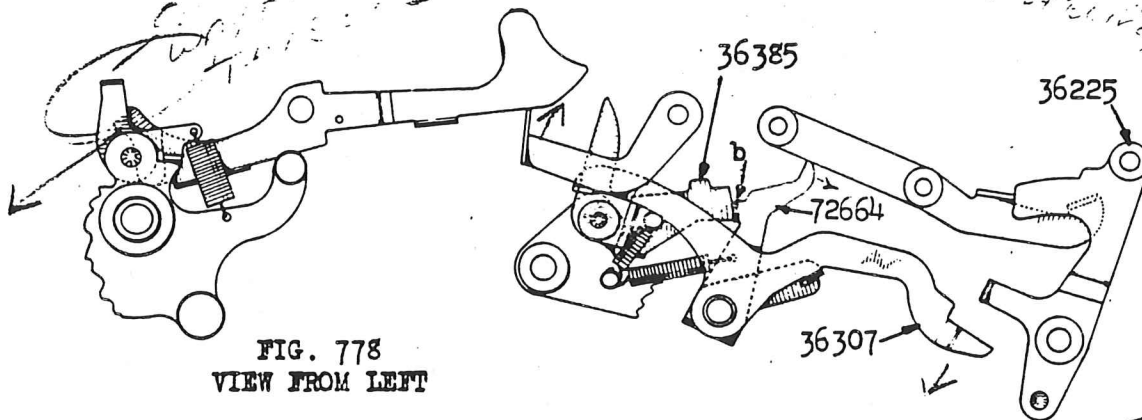


FIG. 778  
VIEW FROM LEFT

12. In rocking to its non-shift position Lever 36307 carries with it Bail 72664, thereby permitting Latch 36385 to fall in behind ear (b) on Bail 72664 and hold these parts in their non-shift position after Lever 36225 is recocked. Fig. 778.

13. When the carriage dips Lever 72665 rocks Latch 72683 down to underlie ear (c) on Latch 36385. Upon rise of carriage, Latch 72683 kicks out Latch 36385 thus releasing shift mechanism to neutral. (See paragraph 11 page 615) Fig. 779

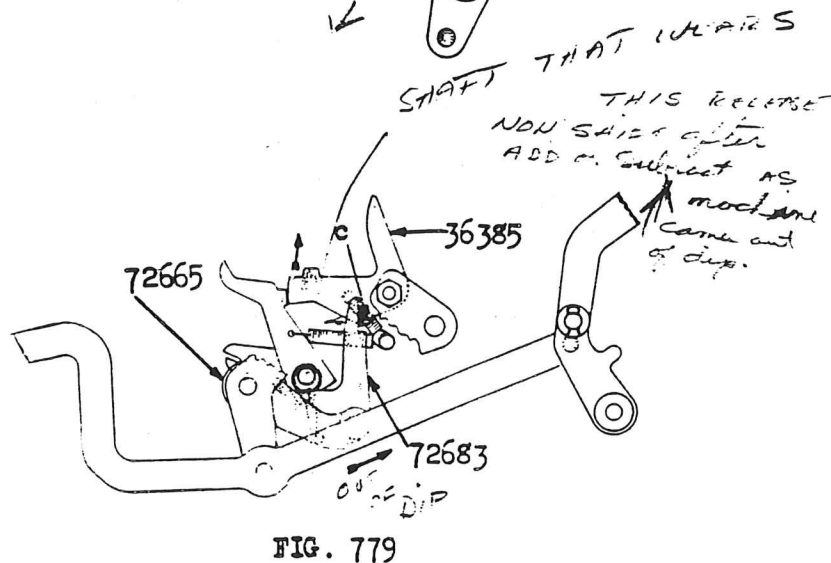


FIG. 779

SUBTRACT BAR

14. Subtraction is the same as addition except ear (o) on Subtract Bar Stem 37040 forces Lever 36500

forward and positions 36495 to its negative position. Nose of Link 36228 underlies ear (p) on Lever 36500 and locks mechanism in its negative position until Lever 36225 is recocked. Fig. 780.

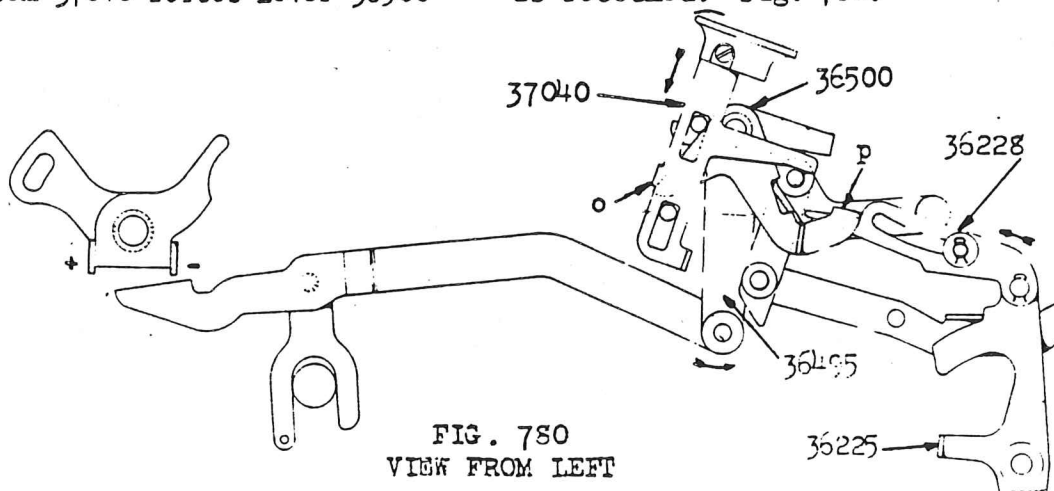


FIG. 780  
VIEW FROM LEFT



## STOP KEY

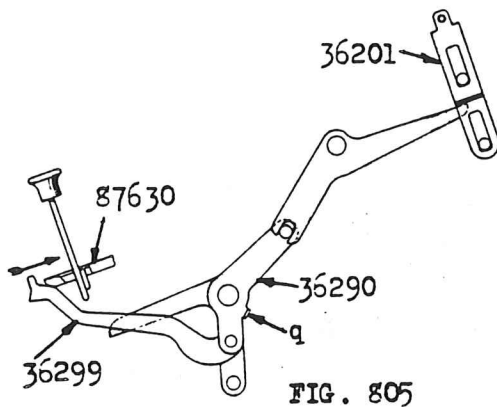


FIG. 805

1. A depression of the Stop Key 36201 pulls Lever 36299 rearward causing Lock Bar 87630 to release a depressed Multiplier or Zero Key. Fig. 805.

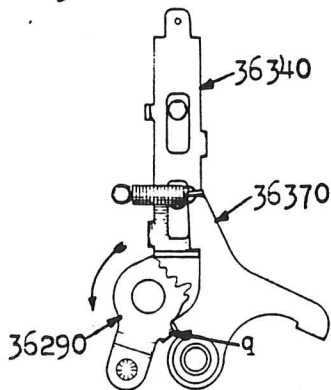


FIG. 806

2. A depression of the Stop Key 36201 rocks Lever 36290 in the direction of arrow, and ear (q) on the latter forces Latch 36370 to release the depressed Short Cut Key 36340. Fig. 806.

3. With the machine operating in division, a depression of Stop Key 36201 rocks Lever 36290, which forces Link 37292 rearward to disengage Latch 36316 from Lever 36116. This allows Division Key 37110 to rise slightly and prevent 36316 from relatching. At this first depression of Stop Key 36201, ear (r) on Guide 37320 acting on surface (s) of Link 37292 holds the link down so that nose (t) of the link will ride under and miss ear (u) of Roller Latch 36460. Therefore the roller latch will not be disengaged from main Clutch Dog 36540. When Link 37292 is in this lower position ear (v) on the link contacts the lower end of the tail on Latch 36316 causing Link 37292 to be cammed downward so that nose (t) does not rise up to contact ear (u) until Link 37292 is retracted, even though ear (r) is let up in the meantime by the rocking of Latch 36316. Fig. 807.

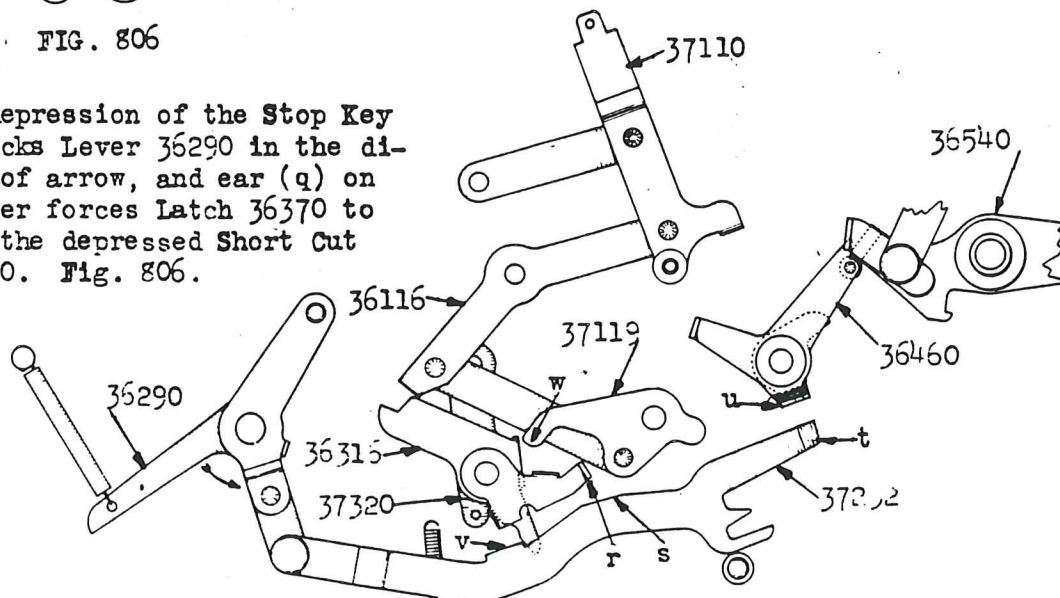


FIG. 807

STOP KEY . Cont'd

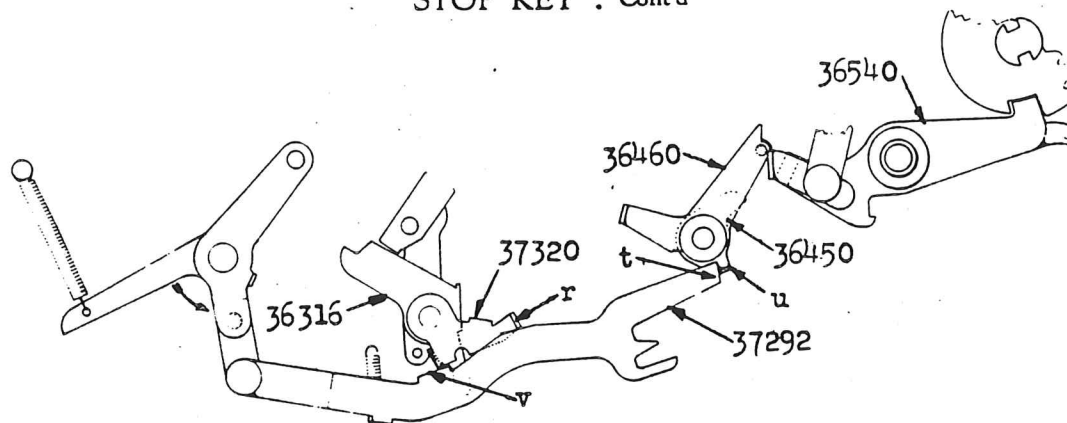


FIG. 808

4. If no further depression of Stop Key is made the machine will run out the division in the respective order, and will stop, and the division key will return to normal position, having been freed to do so by the withdrawing of Latch 36316.

5. However, if a second depression of Stop Key 36201 is made before the division runs itself out, ear (r) on Guide 37320 having risen, permits nose (t) of Link 37292 to contact ear (u) on Lever 36450 and disengage Roller Latch 36460 from Main Clutch Dog 36540 stopping the machine. In this higher position of Link 37292, ear (v) engages a notch in the tail of Latch 36316 which prevents it being cammed down in the manner described in paragraph 3, page 621. Fig. 808.

6. When the Division Key 37110 is up in neutral position, ear (r) on Guide 37320 is held in its down position by nose (w) on Lever 37119 thus preventing stop key from stopping machine in a manner which might leave the Trip Unit out of time. Fig. 807.

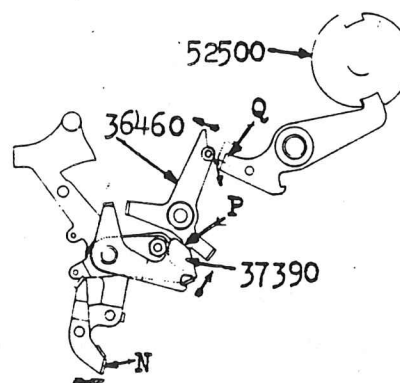


FIG. 809

7. The Stop Key, therefore, can only serve to stop the Main Clutch 36540 during Automatic Division, but should the Main Clutch accidentally start running continuously at any other time, it can be stopped by pushing rearward on ear (N) of the division recocking mechanism through the longitudinal slot in the bottom cover. Pressing on ear (N) of Division Operating Lever 37390 rocks Lever 37390 against ear (P) on Roller Latch 36460 and forces Latch 36460 from under ear (Q) of Main Clutch Dog 36540 thus stopping machine. Fig. 809.



INTERLOCKS

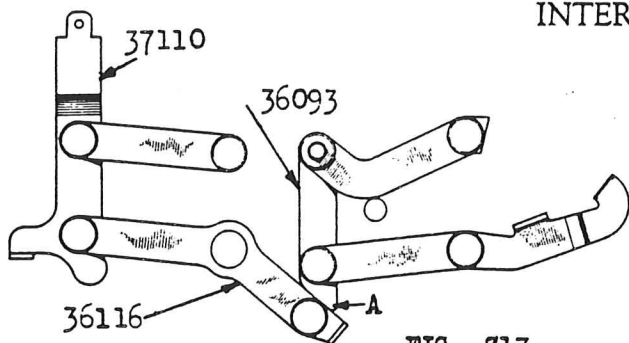


FIG. 817  
VIEW FROM LEFT

1. During add or subtract operation nose (A) of Link 36093 contacts Lever 36116 and prevents depression of Division Key 37110. Fig. 817.

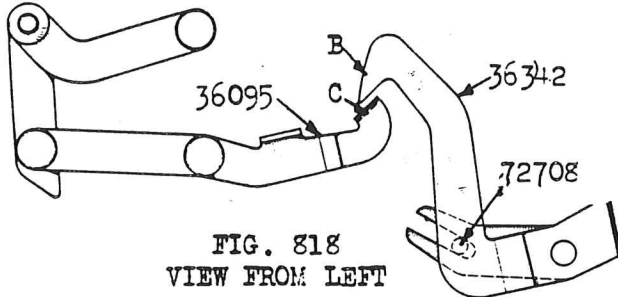


FIG. 818  
VIEW FROM LEFT

2. During multiplication, Interlock 36342 is forced rearward by Stud 72708 on Parallel Bar 36650 causing nose (B) on interlock to overlie ear (C) on Lever 36095 thus preventing depression of add bar, until multiplier key is let up. Fig. 818.

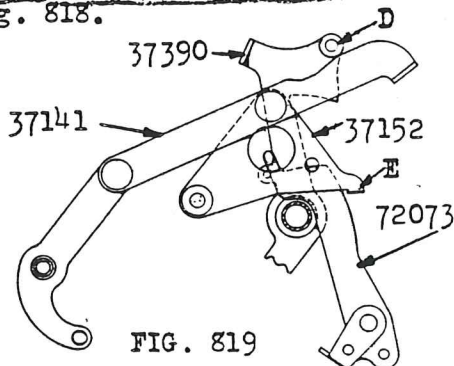


FIG. 819

3. During division, roller (D) on Division Lever 37390 forces Lever 37152 downward by means of Bar 37141 so that ear (E) positions in rear of Interlock 72073 thus preventing a shift operation until Lever 37390 is cocked back. Fig. 819.

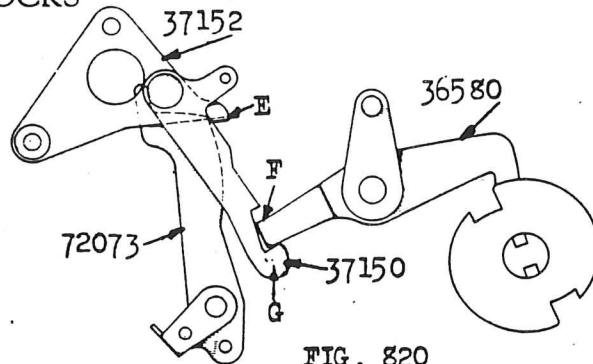


FIG. 820

4. During all other operations upon starting the setting clutch, ear (F) on Clutch Dog 36580 engages hook (G) on the end of Link 37150, and lowers ear (E) on Lever 37152 to block Shift Interlock 72073 thus preventing a shift during the setting clutch operation. Fig. 820.

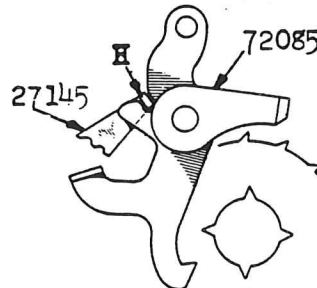


FIG. 821

5. Before ear (E) is allowed to move out of blocking position with respect to Interlock 72073, ear (H) on Lever 27145 engages a notch in Bell Crank 72085 preventing its movement and thus preventing a shift until the carriage rises. Fig. 821.

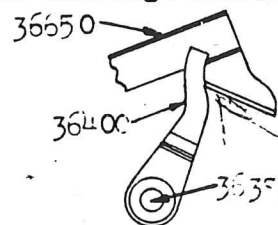


FIG. 822

6. Depression of a Multiplier Key lowers shelf on 36650 which blocks Lever 36400 preventing depression of Division Key 37110 while Multiplier Key is held down. Fig. 822

INTERLOCKS Cont'd

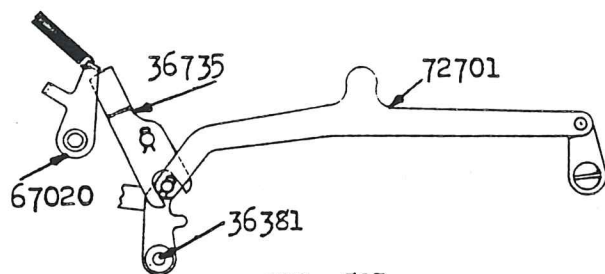


FIG. 823

7. During multiplication the carriage dips and Link 72701 positions Interlock 36735 into path of Lever 67020 thus blocking depression of the division key which is connected to Lever 67020. Fig. 823.

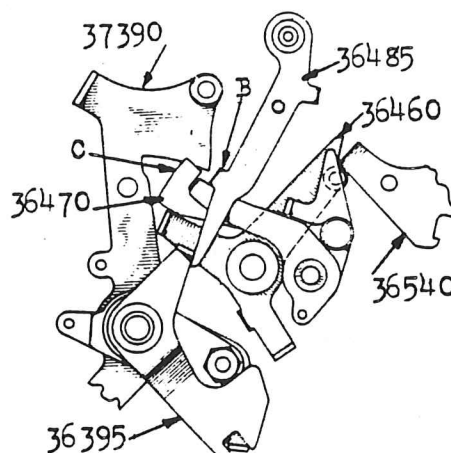


FIG. 826

10. Depression of the division key releases Lever 37390 which operates Lever 36395 to force Lever 36485 rearward and permit Roller Latch 36460 to seat under Main Clutch Dog 36540 thus allowing the Main Clutch to continue to operate until Latch 36460 is tripped by the division control mechanism. During the plus stroke in division Lever 37390 is recoiled, allowing ear (B) of Lever 36485 to return over nose (C) of Lever 36470, thus limiting the machine to one plus stroke. Fig. 826.

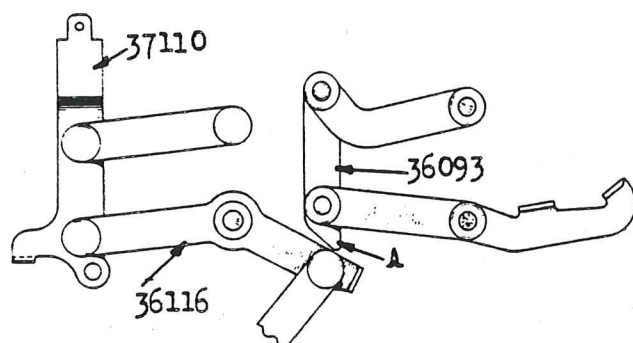


FIG. 824  
VIEW FROM LEFT

8. When Division Key 37110 is depressed, Lever 36116 contacts nose (A) of Link 36093 and prevents depression of the add and subtract bars. Fig. 824.

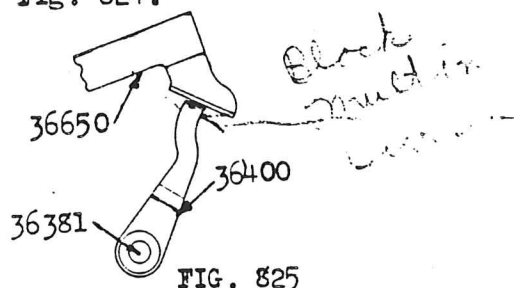


FIG. 825

9. Lever 36400 is rocked rearward under shelf on Parallel Bar 36650 by Division Key 37110 thus preventing operation of multiplication keys while the division key is depressed. Fig. 825.

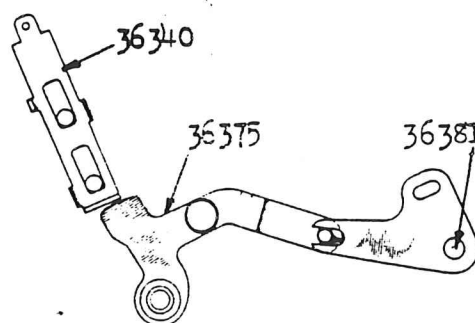


FIG. 827

11. Depression of division key rocks Lever 36375 forward under shelf on Short Cut Key 36340 thus preventing depression of the short cut key. Fig. 827.



INTERLOCKS . Cont'd

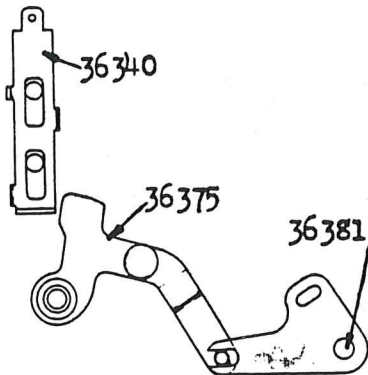


FIG. 828

12. When Short Cut Key 36340 is depressed Lever 36375 prevents depression of Division Key 37110 which is directly connected to Shaft 36381. Fig. 828.

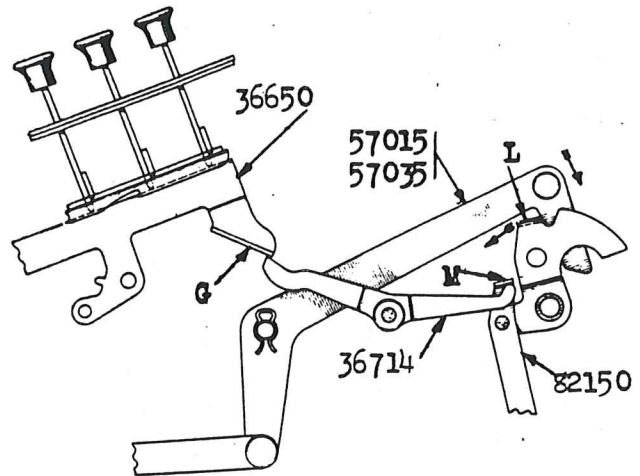


FIG. 829

13. When either the upper or lower clear key is depressed the multiplier keys are locked against depression because the lowering of Lever 57035 or 57015 blocks rearward movement of ear (L) of Switch Control 82150 thus holding down ear (M) and through Lever 36714 blocking ear (G) of Parallel Bar 36650. Fig. 829.

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**CLEAR RETURN MODEL  
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# MARCHANT

## CR - MECHANISM

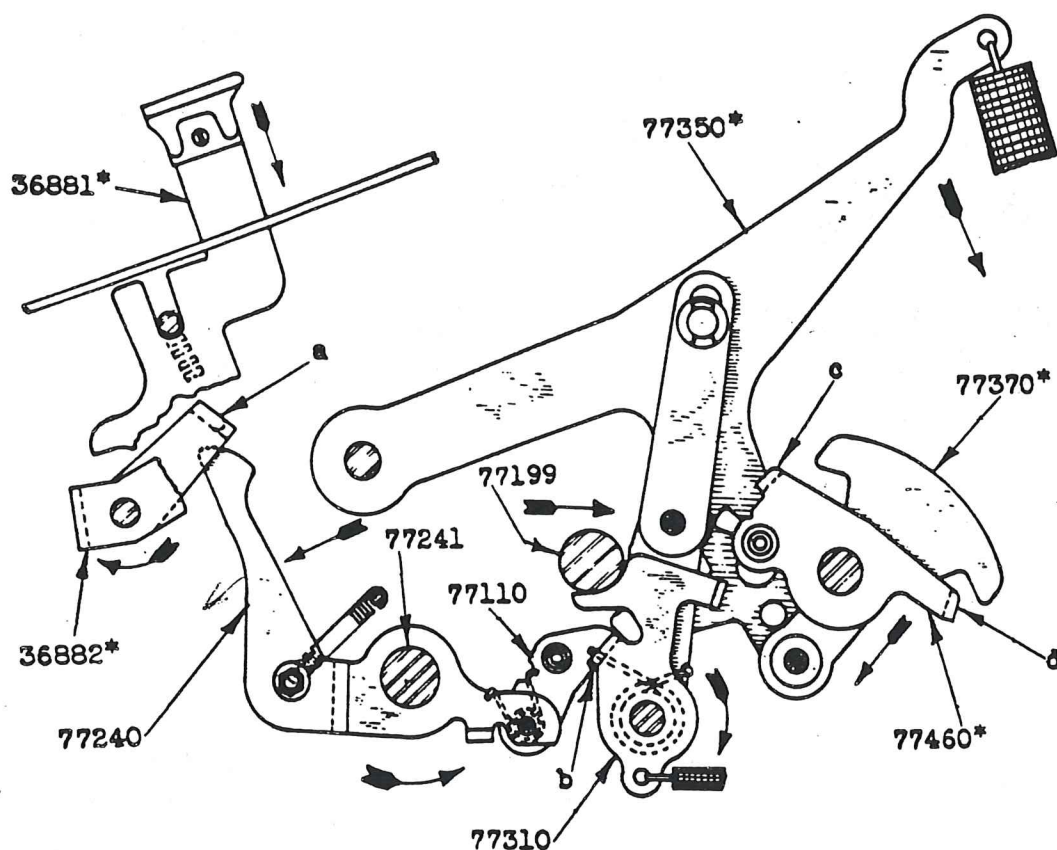


Fig. 980

1. Model "CR" is equipped with a selective carriage return mechanism operated by a Master Key similar to the Master Tabulator Key, but effecting a carriage return to either end position only.

2. Depression of the Clear Return Key 36881\* rocks Bail 36882\*, causing ear "a" to rock Operating Arm 77240 about Stud 77241. Mounted directly on the Operating Arm is a

Live Point 77110 which is forced against ear "b", tripping the Tabulator Toggle 77310 and permitting the spring urged Tabulator Starting Lever 77350\* to lower the Tabulator Tee Member 77370\* against ear "c" or "d" on 77460\*, effecting a shift to the right or left according to the setting of the control on the keyboard.  
Fig. 980.

# MARCHANT

CR - MECHANISM . (Cont'd)

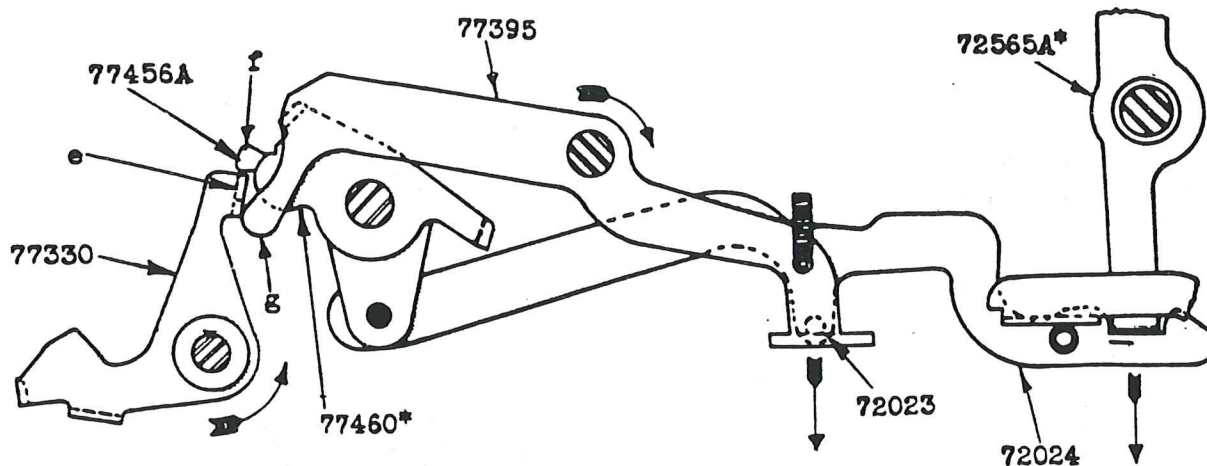


Fig. 981

3. Ear "e" on Tabulator Operating Arm Latch 77330 drops over or under nose "f" of Lever 77456A on 77460\* to continue the shift until the carriage reaches the end position. Fig. 981.

4. During the "extra" end shift, the Shift Terminating Mechanism lowers the Shift Connecting Link 72024 which allows Lever 72565A\* to return to neutral and stop the shift. Stud 72023 rocks Tabulator disabling Lever Interponent 77395 and the nose "g" strikes the ear "e" and forces the Latch 77330 away from 77456A, allowing 77460\* to return to neutral. Fig. 981.

5. This mechanism is nearly identical to the Tabulator Operating Mechanism as described in paragraphs

6, 7, 8, 9, 10, 20, 21, 23 (Pages 703-709) Of Tabulator Service Instruction Book and all adjustments are exactly the same.

6. Tabulator Starting Lever 77345 is recocked and the Toggle 77310 is returned to its initial position against Stud 77199 by Tabulator Re-cocking Lever 77425A during the first shift cycle exactly as described in paragraph 11 (Page 705) of Tabulator Service Instruction Book.

7. All interlocks and adjustments as described in paragraphs 27, 28 and 29 (Pages 711-712) of Tabulator Service Instruction Book apply directly to carriage return mechanism.



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CR - MECHANISM . (Cont'd)

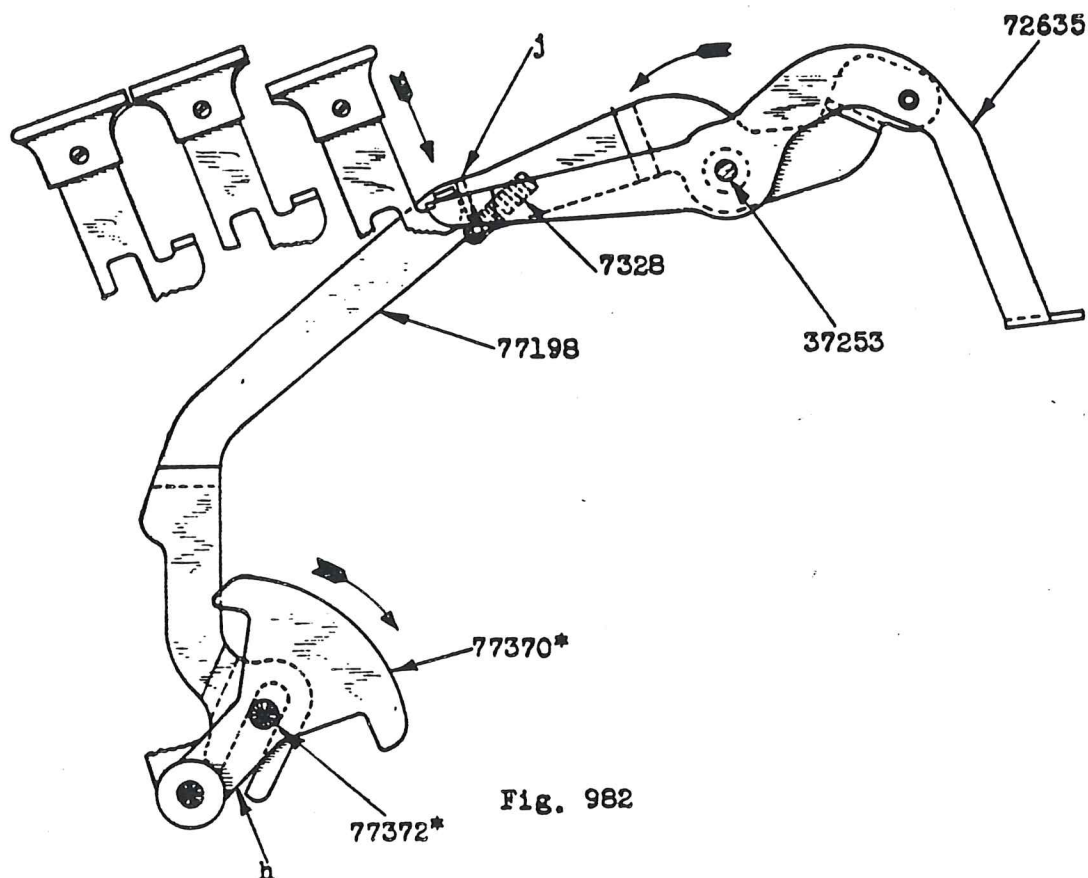


Fig. 982

8. Model "M" direction control is incorporated in the standard automatic shift direction control keys on the keyboard and returns the carriage to the opposite end to that indicated by the arrow on the depressed key. Depression of the upper control key (arrow points to the left) rocks Shift Direction Control Lever 72635 and Carriage Return Control Lever 77198 counter-clockwise about the Tie Bolt 37253. The slot "h", sliding over the Stud 77372\*, positions the Tee Member 77370\* rearward and when the Master Key is depressed, the carriage is

returned to the right end position. Depression of the Lower Control Key, the Non-Shift Key or when all keys are up, allows Spring 7328 to raise Lever 77198 and position the Tee Member forward thus preparing for a carriage return to the left end position. Fig. 982. Adjustment of Lever 77198 should be made by twisting the form at "j" and should be set to throw the Tee Member 77370\* to the same relative positions with respect to the ears "c" and "d" (Fig. 980) for each direction of control. Fig. 982.

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# MARCHANT

## AUTOMATIC CLEAR AND RETURN MECHANISM

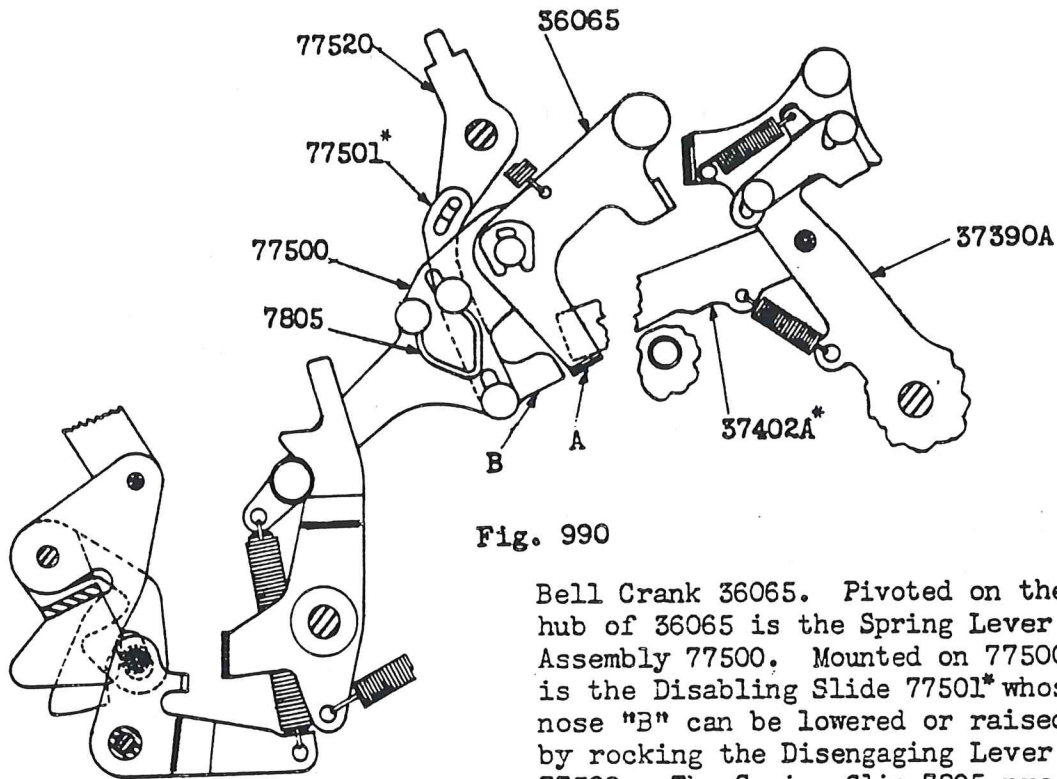


Fig. 990

Bell Crank 36065. Pivoted on the hub of 36065 is the Spring Lever Assembly 77500. Mounted on 77500 is the Disabling Slide 77501\* whose nose "B" can be lowered or raised by rocking the Disengaging Lever 77520. The Spring Clip 7805 produces a toggle effect that holds 77501\* in either extreme position, up or down, and prevents the lever from being in an intermediate position. Fig. 990.

1. In the "Automatic Clear and Return" model the termination of a division operation by the completion of the problem or a depression of the stop key results in the automatic clearance of the product dials, the keyboard and depression of the master tabulator key. If a columnar tabulator key has been previously latched, the carriage will be automatically tabulated to that selected position. The Disengaging Lever 77520 (Fig. 990) may be rocked rearwardly to prevent all of the previously described automatic operations.

2. Depression of the division key releases the Division Operating Lever 37390A to rock rearward and allow the Link 37402A\* to drop behind ear "A" of the Plus Stroke

3. When 77520 is forward, 77501\* is down and the nose "B" is held directly in the path of ear "A" on 36065. The first restore cycle rocks the Lever 37390A forward and Link 37402A\* contacts ear "A" on 36065 rocking that lever clockwise so that ear "A" contacts surface "B" of 77501\* and Lever 77500 is rocked upward about hub on 36065. Slightly before Lever 37390A has reached its farthest forward position, Spring Lever Latch 77515, pivoted on Shaft 36221 and spring urged in an anti-clockwise direction, moves its blocking surface "C" under Roller

## AUTOMATIC CLEAR AND RETURN MECHANISM . Cont'd

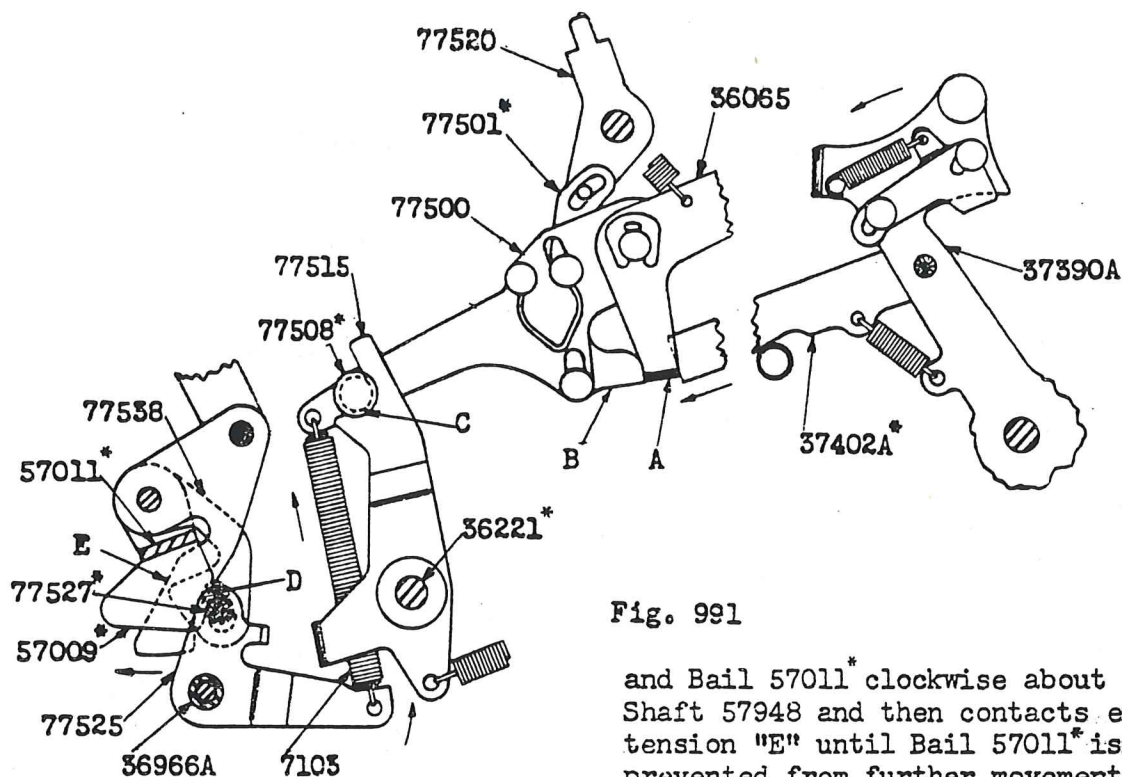


Fig. 991

77508\* on 77500 and as 37390A returns to its latched position Roller 77508\* is forced down, due to tension of Spring 7103 fastened to forward end of 77500, against surface "C" and Lever 77500 is prevented from returning to its normal position. Fig. 991.

4. Pivoted on Bearing 36966A and connected to Lever 77500, by means of tension Spring 7103, is the Clearance Trip Lever 77525. Roller 77527\* on 77525 is positioned in the slot of Keyboard Clear Arm 77538 and also contacts the surface "D" of Lug 57009\* riveted to the Product Clear Bail 57011\* and overlies the extension "E" of the Master Tabulator Bail 36882A\*. Fig. 991. As Lever 77500 is forced upward, 77525 is rocked in an anti-clockwise direction and the Roller 77527\* immediately starts to rock Arm 77538

and Bail 57011\* clockwise about Shaft 57948 and then contacts extension "E" until Bail 57011\* is prevented from further movement due to being blocked by the Product Clear Bail Latch 57919.

5. Depression of the Division Key 37110\* rocks the Shaft 37381\* clockwise and the Division Counter Reverse Arm 67020A\*, being pinned to the shaft, is rocked with it. Pivoted on Stud 36059\*, and connected positively to 67020A\* by means of the Link 57915, is the Product Clear Bail Latch 57919 whose blocking surface "E" moves directly into the path of Roller 57913\* of Product Clear Bell Crank Arm 57912\*. The First restore cycle starts to actuate the automatic clearance mechanism and Roller 77527\* rocks the Product Clear Bail 57011\* as previously described until Roller 57913\* contacts surface "E" of Latch 57919, thereby blocking the product clearance, keyboard clearance and Tabulation until division is completed or terminated. Fig. 992.



## AUTOMATIC CLEAR AND RETURN MECHANISM . Cont'd

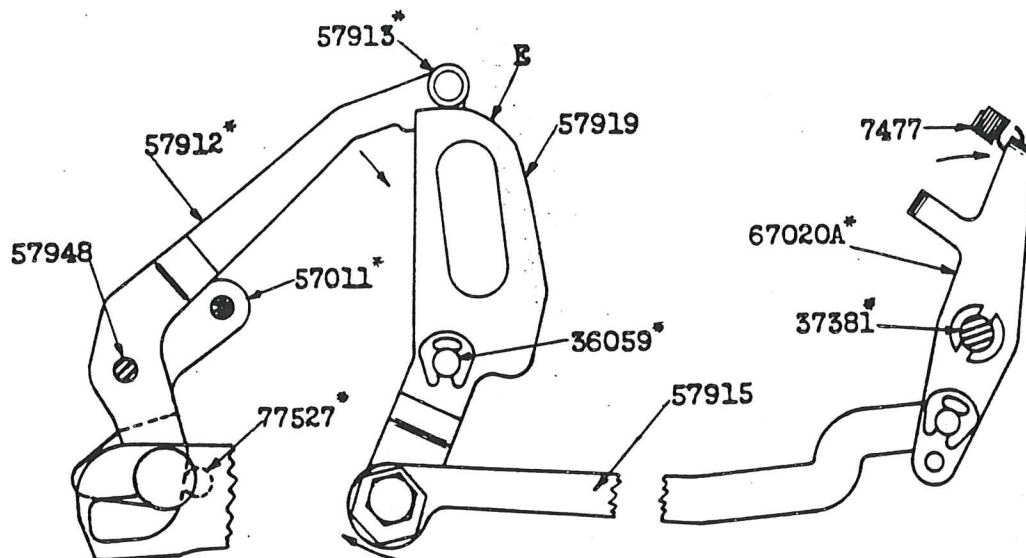


Fig. 992

6. At the completion of division, the division key is released and Arm 67020A\*, under the tension of Spring 7477, rocks the Latch 57919 out from under Roller 57913\*. This transfers the load, due to Spring 7103 (see paragraph 3 page 806), to the Clear Lever 57015B\* acting on Roller 82164\* of the Interlock 82163B\* (not shown) until the last

restore when 82163B\* is rocked from under 57015B\* and Roller 57913\* rides along surface "L" of Latch 57919 as Clear Bail 57011\* is free to rock about Shaft 57948. Roller 57913\*, when in lowest position, should first clear surface "L". Adjust by means of Eccentric Nut 57911. Fig. 993.

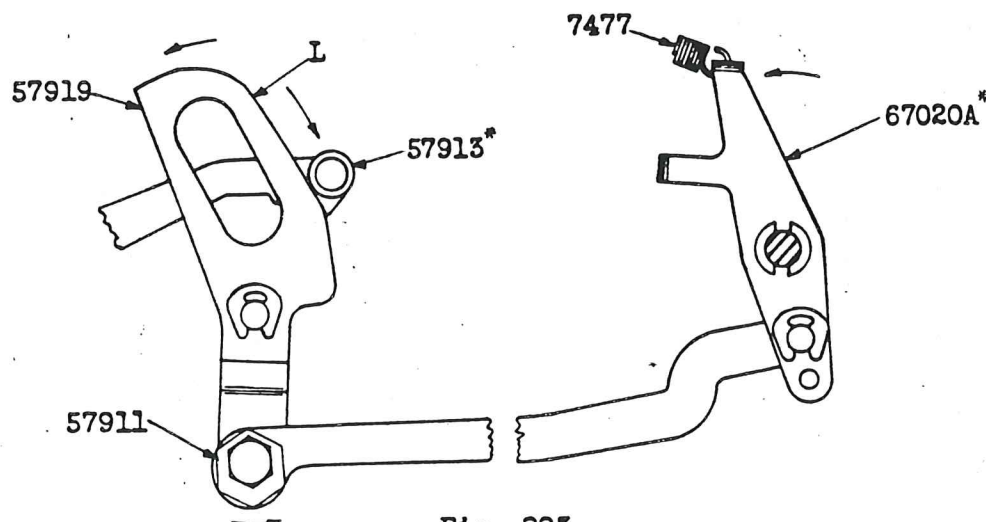


Fig. 993

## AUTOMATIC CLEAR AND RETURN MECHANISM . Cont'd

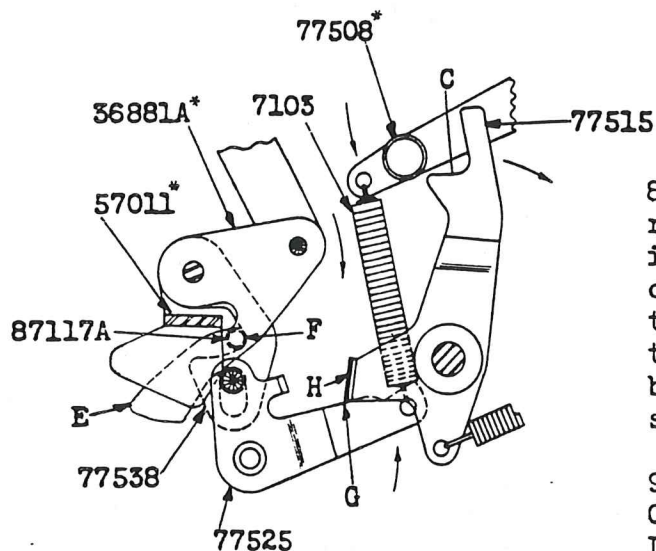


Fig. 994

7. The release of Bail 57011\* allows Lever 77525, under the tension of Spring 7103, to rock Bail 57011\*, Arm 77538 and depress the Master Tabulator Key 36881A\* by contacting the extension "E" of Bail 36882A\*. The rocking of 57011\* actuates the product clearance while that of Arm 77538 causes surface "F" to contact Clear Gate Stud 87117A and clear the keyboard. The depression of the Master Tabulator 36881A\* results in the tripping of the toggle, providing that a columnar tabulator key has been latched down and the carriage is not in the same order as the latched columnar key. Fig. 994.

8. Before Lever 77525 has been rocked to its extreme position its face "G" contacts ear "H" on Latch 77515 and disengages the nose "C" from Roller 77508\* thereby allowing all parts to be returned to their normal position. Fig. 994.

9. To disable the "Automatic Clear and Return" mechanism, Lever 77520 may be rotated rearward lifting nose "B" of Slide 77501\* out of path of ear "A" on Plus Stroke Bell Crank 36065 thus preventing actuation of Spring Lever 77500. Fig. 995.

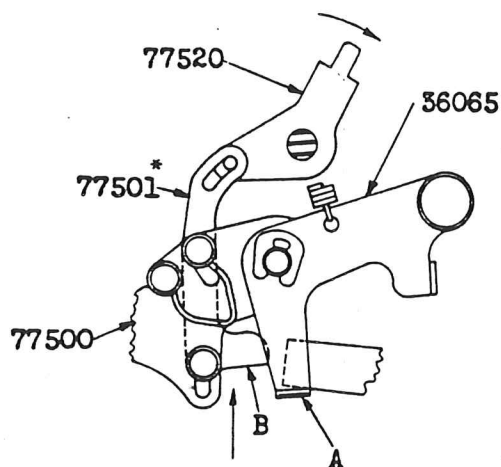


Fig. 995



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## AUTOMATIC CLEAR AND RETURN MECHANISM . Cont'd

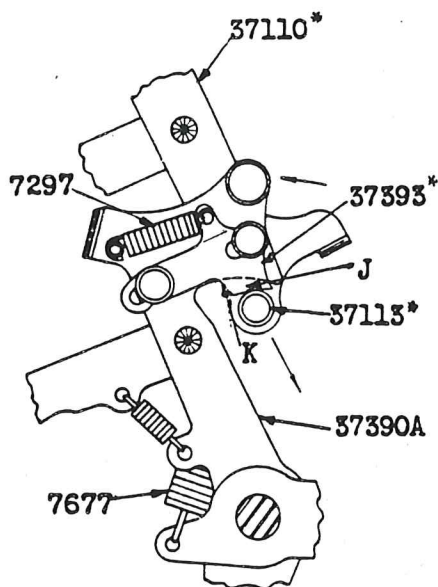


Fig. 996

10. As Division Key 37110\* is depressed its Roller 37113\* is lowered below the hatchet-shaped head of Division Operating Lever 37390A allowing it to be rocked rearward by Spring 7677. To insure latching of division key before actual operation starts, the face "J" of the Division Key Latching Cam 37393\*, mounted on the head of Lever 37390A, contacts Roller 37113\* on Division Key 37110\*, and forces that key into a lower position when Lever 37390A is rocked rearward. When 37390A is recocked, the front face "K" of Cam 37393\* is contacted by Roller 37113\* and moves up and rearward against pull of Spring 7297 which returns it to normal when contact is broken. Fig. 996.

11. In the Automatic Clear and Return model the tabulator tripping mechanism consists primarily

of the Toggle 77590, Live Point 77570\* affixed to Bail 77105B and the Latch 77565A. The Stud 77559 is located toward the front of the machine so that in its latched position the toggle is definitely past center and it is only prevented from being tripped by the restraining ear "A" resting against surface "B" of latch 77565A. The correct position of the Toggle Stud 77559 is obtained when the surface "C" of the lower toggle link just moves away from the Hub 77564 of the Latch 77565A. Test by moving the lower toggle link forward, using a spring hook or similar tool, until the surface "C" touches Hub 77564\* and then slowly remove tool. Clearance between surface "D" and ear "E" is .030" to .040" and may be obtained by adjusting Key Section 77065. Fig. 1000.

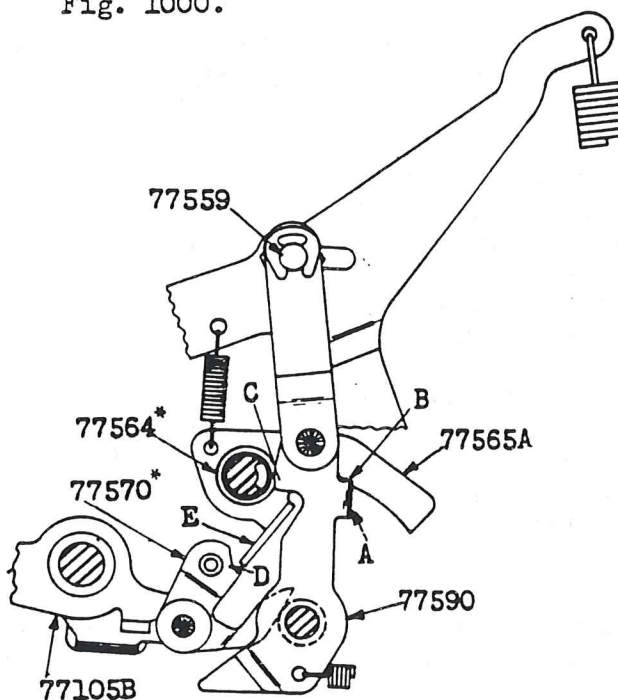


Fig. 1000

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## AUTOMATIC CLEAR AND RETURN MECHANISM . Cont'd

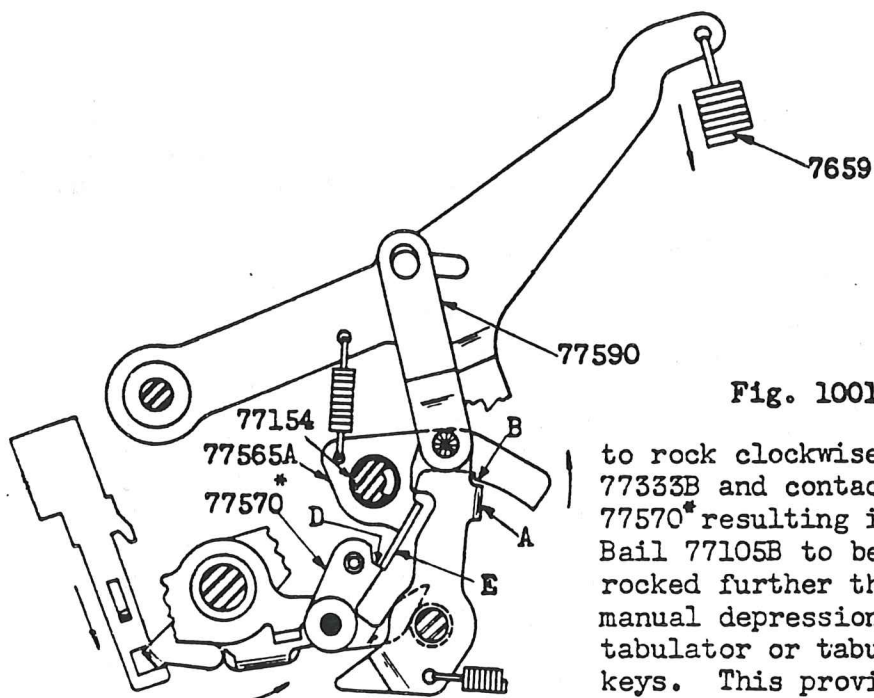


Fig. 1001

12. Depressing any tabulator key, other than one whose order corresponds to the position of the carriage, past its latched position results in the surface "D" of the Live Point 77570\* contacting the ear "E" of Latch 77565A and rocking it anti-clockwise about Shaft 77154. The rocking of 77565A causes the surface "B" to move away from ear "A" of Toggle 77590 until it is clear of ear "A" and as the Toggle 77590 is already in a broken position it collapses, under the tension of Spring 7659, to rock the Shaft 72951\* (as described under Tabulator, see paragraph 7, page 703) and start a tabulating shift. Fig. 1001.

to rock clockwise about Stud 77333B and contact Live Point 77570\* resulting in the Tabulator Bail 77105B to be positively rocked further than through a manual depression of the master tabulator or tabulator columnar keys. This provides sufficient overstroke of blocking ear "G" on 77109A\* so as to permit adequate adjustment of ear "H" on Latch 77330 and insure Live Point 77570 not engaging ear "E" of Latch 77565A during a tabulating shift. Fig. 1002.

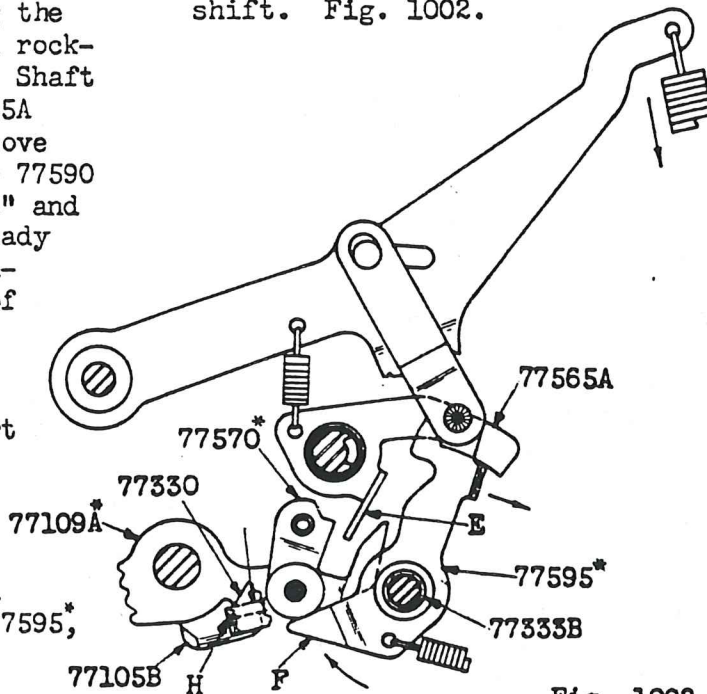


Fig. 1002

13. The collapsing of the toggle causes the extension "F", of Lower Toggle Link 77595\*,



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## AUTOMATIC CLEAR AND RETURN MECHANISM . Cont'd

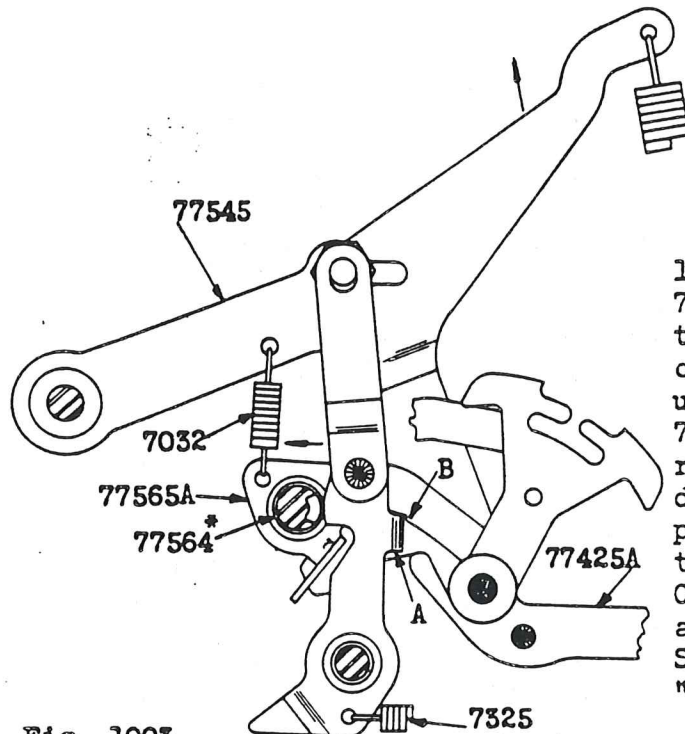


Fig. 1003

14. When the Tabulator Starting Lever 77545 is recocked by Lever 77425A, (as described in Tabulator Section, see paragraph 11, page 705), the toggle due to the overstroke of the recocking mechanism is momentarily held against the Hub 77564\* of Latch 77565A by Spring 7325 and the Latch 77565A under action of Spring 7032 is allowed to return to its latching position. Fig. 1003. The termination of the overstroke results in the ear "A" coming to rest against surface "B" of Latch 77565A until it is again released by the depression of a tabulator key.

15. To prevent tripping the Toggle 77590 and actuating a shift when a tabulator key depressed is in the order corresponding to the position of the carriage, a disabling action instead of blocking is used.

16. Keyed rigidly to the Shaft 77154 is the Tabulator End Control Lever - Right 77580. Pivoted to Shaft 77582 is the Tabulator Live Point Disabling Arm 77585. As the Shaft 77154 is rocked, in either direction, due to action caused by the depression of a tabulator key, or through the Controller 77265 and Control Levers 77180 (not shown) as the carriage is shifting, the Stud 36727\* will move in the slot "J" of Lever 77585. Fig. 1004.

17. When the Stud 36727\* moves toward the center "K", Lever 77585 is rocked in a clockwise direction, causing the lower end "L" to rise. Also, as the Stud 36727\* moves away from the center "K", it cams the bottom of the slot "J" and positively rocks Lever 77585 anti-clockwise thus lowering its lower end "L". Fig. 1004.

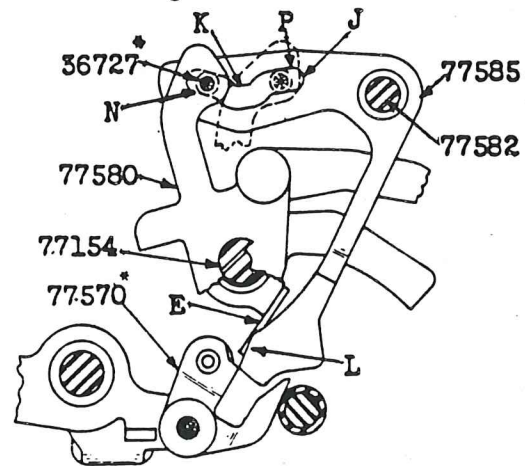


Fig. 1004

## AUTOMATIC CLEAR AND RETURN MECHANISM . Cont'd

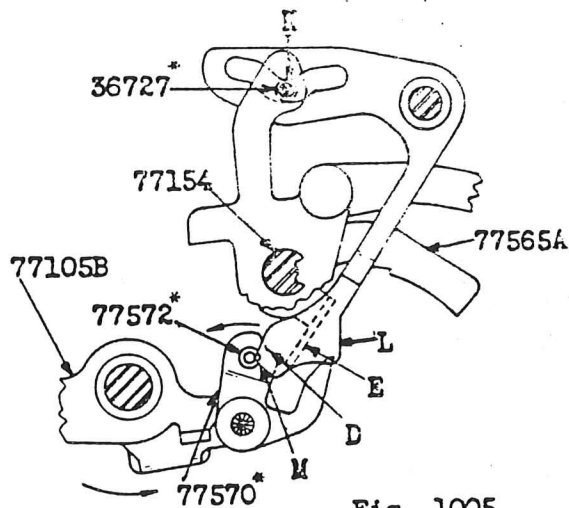


Fig. 1005

18. If a tabulator key that is in the order corresponding to the position of the carriage is depressed and latched, the Shaft 77154 will be held in its central position by the Controller 77265 and the Stud 36727\* positioned at the center "K" resulting in the lower end "L" being raised to its highest position. Fig. 1005. As the key is depressed past its latched position, the Live Point 77570\* is rocked anti-clockwise with Bail 77105B, and Stud 77572\* contacting the surface "M" cams 77570\* upward so that the surface "D" misses the ear "E" of latch 77565A, thus disabling the tripping mechanism. Fig. 1005.

19. Depressing any key, other than that in the same order as the position of the carriage, the Stud 36727\* will be positioned at either "N" or "P" depending on which side of the Controller 77265 the key is depressed. In either of these positions the end "L" of Disabling Arm 77585 will be in its lowest position and the Live Point 77570\* is free to contact ear "E" and release the toggle. See Fig. 1004.

20. If the power is disconnected from the machine and a tabulator key is depressed so as to trip the toggle, the Starting Lever 77545 will move downward and hold "Tee" 77371\* under the action of Spring 7659, against one of the ears "l" or "r" of Lever 77460\* until power is restored to the machine. Moving the carriage manually, with the tabulator mechanism in this operative position, will cause the Controller 77265 to travel through the Control Levers 77180 until it reaches the particular control lever whose tabulator key is latched, at which time the Shaft 77154 will be rocked. Tabulator Tee Member Yield 77375\* is pivoted, alongside of Tabulator Tee 77371\*, about Stud 77358A\* and connected to 77371\* by means of Spring 7038. Tee 77371\* being held rigidly, due to the toggle being tripped allows the Shaft 77154 to rock by means of 77375\* yielding through Spring 7038, thus preventing the control levers from being bent. Fig. 1006.

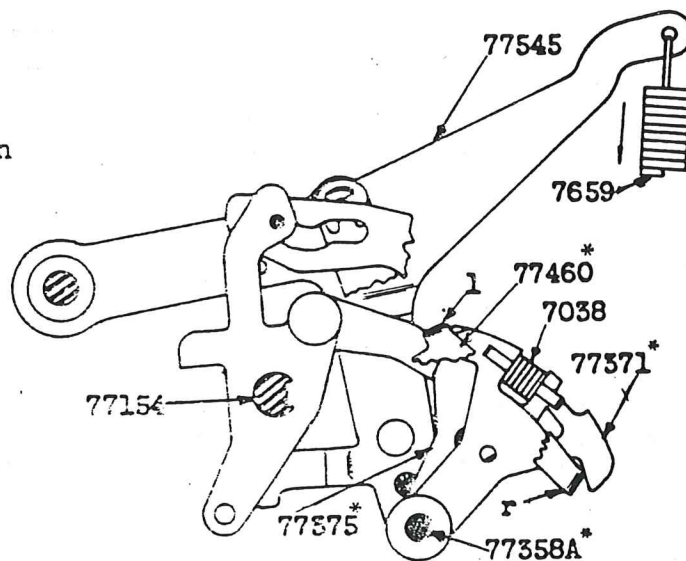


Fig. 1006



**MARCHANT**

**EASY DIVISION KEY  
MECHANISM**

**COUNTER RESTORE  
MECHANISM**

**SERVICE  
INSTRUCTION  
BOOK**

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# MARCHANT

## EASY DIVISION KEY MECHANISM

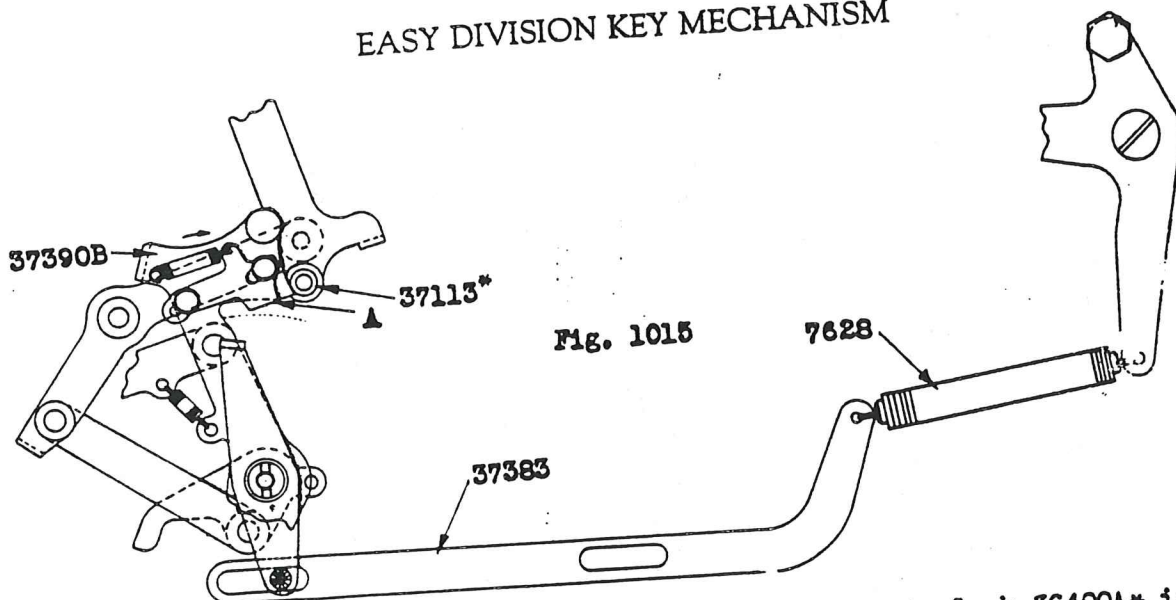


Fig. 1015

1. The following described mechanisms have been incorporated into all Marchant models in order to relieve the load of operation on the Division Key and to positively position the counter to multiplication position by the action of the setting mechanism rather than by spring operation as previously employed.

2. Power to force the Division Key down is taken from the Hatchet 37390B with the face (A) altered to act against the roller 37113\* on Division Key after the initial downward motion effected by the operator. Power to return the key is effective during dip through the spring 7628 and link 37383. Figure 1015.

3. Minor changes necessary to complete the mechanism are: (1) Face of Division Short Cut Interlock 36375B altered to provide more direct blocking action of Division Key and also to reduce friction against Short Cut Key. A yield added to 36391A\* to prevent lowering Division Key by quick depression of the Non-Shift Key.

(2) Face of Interlock 36400A\* is altered to reduce friction against ear \*B\* on Interlock 72632 upon depression of the Division Key during a Shift operation. Model M. Figure 1016. (3) Carriage Rise Control Cam 62074B is altered to prevent possible blocking action against Follower produced by force of Spring 7628. No adjustments.

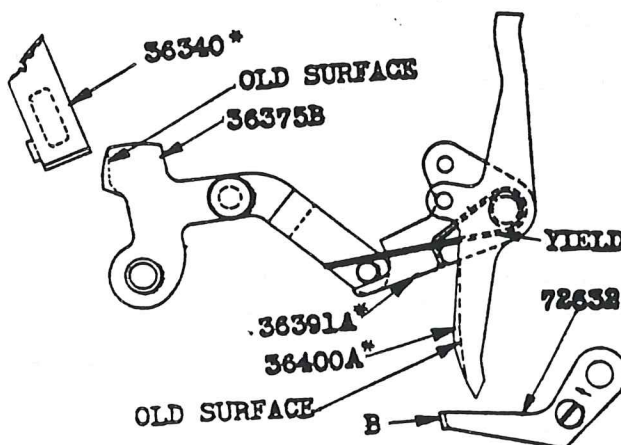


Fig. 1016



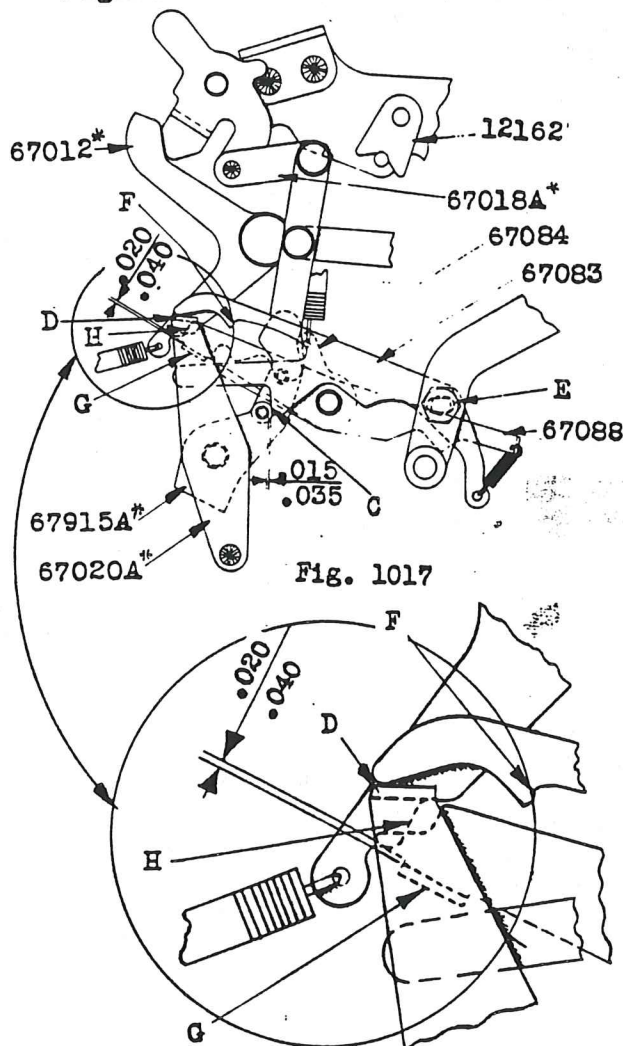
## COUNTER RESTORE MECHANISM

1. Formerly, the automatic portion of the Counter Control Linkage was spring returned to its Multiplication position following completion of a division operation. With the new mechanism, depression of the division key positions the lever 67915A\* to Division setting where it is retained by Pawl 67084 until the setting cycle of the next operation. If an addition, subtraction or multiplication operation is then effected by the operator, nose "C" on Counter Return Lever 67083 will strike the stud on Lever 67915A\* and set the counter to its multiplication position. If, however, a division operation is again effected, ear "D" on Lever 67020A\* will raise Counter Return Lever so that the nose "C" will pass over stud on Lever 67915A\* during the ensuing Setting Cycle and the counter will retain its Division Setting.

2. Adjust Lever 67083 at slot "E" so that nose "C" clears stud 67081\* about .015 - .035 in the neutral position. (Counter set for Division.) See Figure 1017. Hook "F" serves to delay the rise of the Division Key until second Division setting cycle in the same manner previously effected by Division Interlock Latch 36743.

3. Division Interlock Blocking Lever 67088 serves to prevent the redepression of the Division Key until the completion of the last Division Restore operation in the same manner previously effected by Division Interlock Blocking Lever 36744. Ear "G" on 67088 moves in front of surface "H" on Counter Reverse Pawl 67012\* during the dip and prevents manual reversal of the

counter during main clutch operation. This ear should be adjusted to clear the lower end of surface "H" by .020 - .040. See Figure 1017.



4. The Counter Clearance in Division is effected through Lever 67020A\* rather than through 67915A\* as before.

5. The interlocking ear has been removed from the Counter Reverse Lever Link 67018A\*. Plate 12162 replaces Counter Reversing Lever Latch 67909A.

# MARCHANT

## SELECTIVE POSITION RETURN MODEL SERVICE INSTRUCTION BOOK

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## SELECTIVE POSITION RETURN MECHANISM

(Models: ACR8M, ACR8D, and ACR10D)

1) The above machines differ from the ACR10M in that the Columnar Tabulator Keys have been removed from the keyboard and Selective Position Keys placed in the carriage. These keys are so arranged that when any one is depressed the Shift Terminating Mechanism will be tripped as the carriage approaches the position indicated by the numeral on the depressed key, thereby stopping the carriage in that position. See Figure 1020.

2) The mechanism is so designed that it will operate only during a right shift, the Carriage Return Control Lever 77198 being removed

so that the direction of tabulation is no longer controlled by the auto-shift direction control keys, and the Tabulator Tee member being urged rearward by spring 7028 so as to cause only a right shift.

3) With the carriage moving to the right, the shift will be stopped at a position corresponding to a depressed Selective Position Key regardless of whether the shift was initiated by the Clear Return Key or by holding down the Right Manual Shift Key. The shift must be started by one of these methods, however, since depression of a Selective Position Key does not start the shift mechanism.

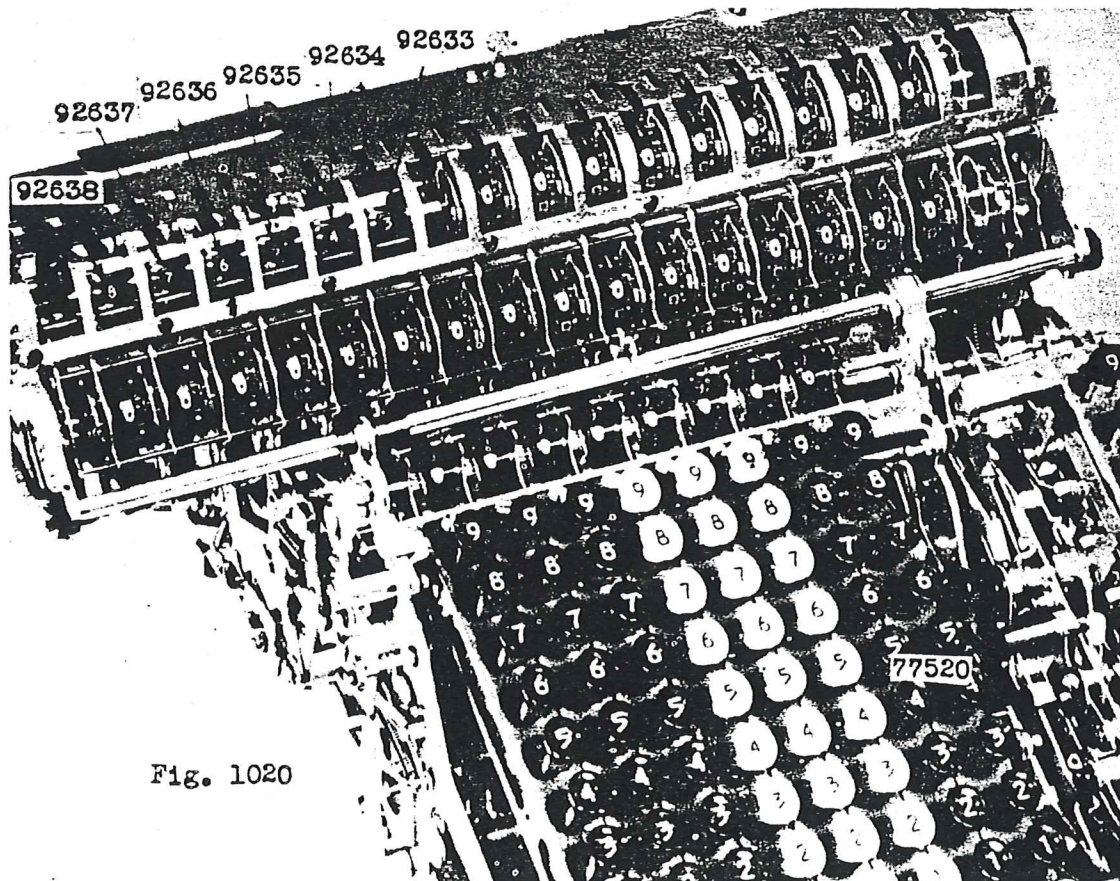


Fig. 1020



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## SELECTIVE POSITION RETURN MECHANISM . (Cont'd)

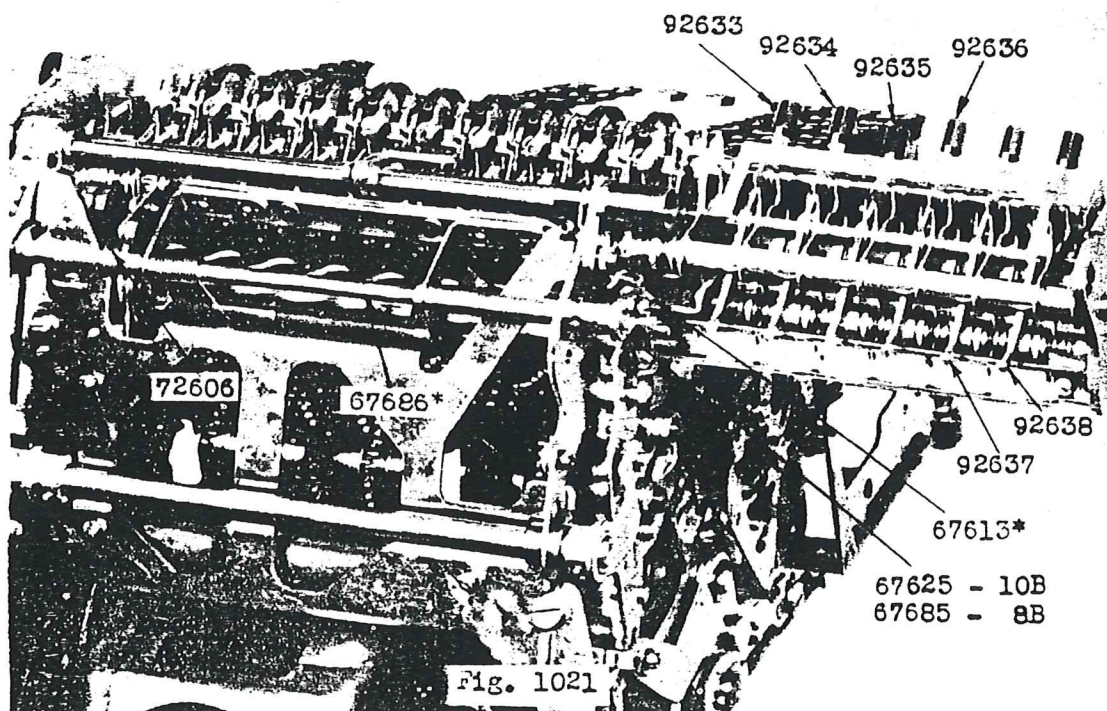
(Models: ACRBM, ACR8D, and ACR10D)

4) If more than one Selective Position Key is depressed simultaneously, all such keys will remain latched down and the shift will terminate in a position corresponding to each such key successively. The shift must be re-started by one of the methods mentioned in paragraph 3 after each of the above terminations.

5) Referring to Figure 1020, the Selective Position Keys are numbered from 3 to 8 (part numbers 92633 to 92638 inclusive) on 8 bank machines, and from 3 to 10 (part numbers 92633 to 92640 inclusive) on 10 bank machines. When the carriage shifts to the right a depressed Selective Position Key will engage Selective Position Live point 67613\* causing Selective Position Lever Assembly 67625 (67685 on 8

banks) to rock upward. This motion rocks Shift Terminating Trip Lever 72606 which is keyed to shaft 67626\* (67686\* on 8 banks) thereby disengaging Shift Connecting Link 72024 (Fig. 440, P. 715) and stopping the shift on completion of the current cycle. See Figure 1021.

6) Selective Position Keys 3 to 9 (3 to 7 on 8 bank machines) are latched down by lock gate 92608 (92658 on 8 banks) which is urged downward by spring 7126. The 10 key (8 key on 8 banks) cannot be latched down due to the formed down portion "a" at the left end of the lock gate. The function of the 10 key is to release all other depressed Selective Position Keys, which are raised by springs 7153 attached to shaft 92614 (92648 on





# MARCHANT

## SELECTIVE POSITION RETURN MECHANISM . (Cont'd)

(Models: ACR8M, ACR8D, and ACR10D)

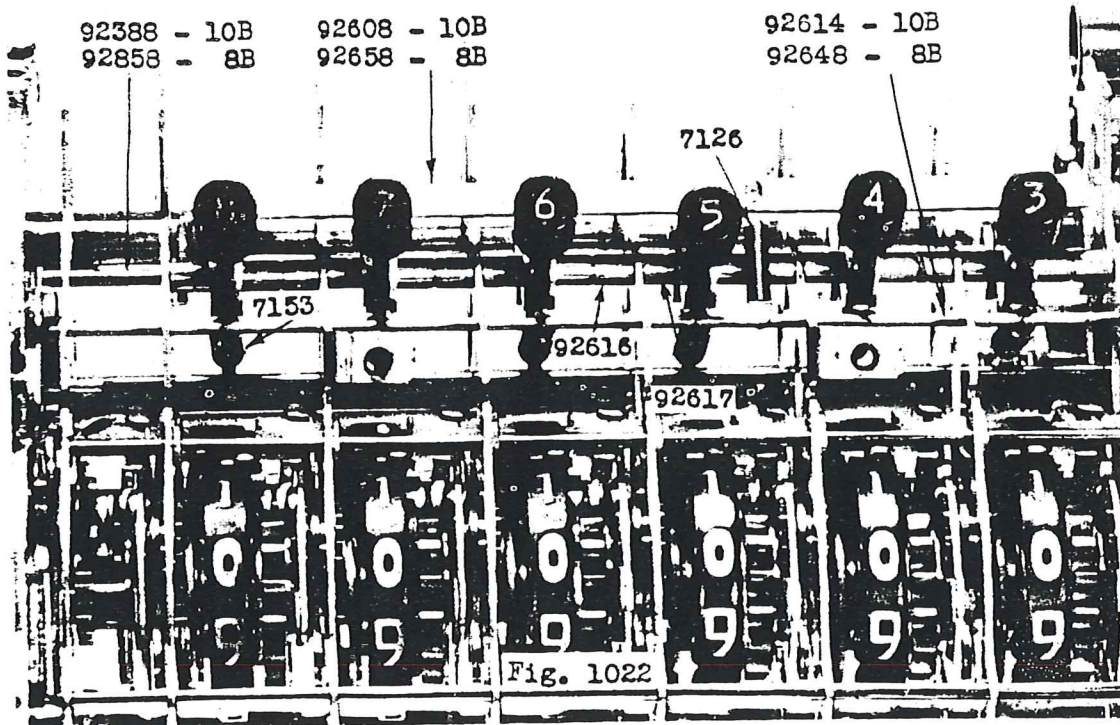
8 banks). Since with no keys depressed the carriage will shift to the end position, the depression of the 10 key will condition the carriage to shift into the 10 position. Figures 1022 and 1023.

7) When the carriage is shifted to the left with one or more of the Selective Position Keys depressed, Live Point 67613\* is allowed to yield by spring 7297 thereby preventing a termination of the shift.

8) The "clear return" mechanism is similar to the mechanism formerly used in CR8M machines except that the "automatic clear and return mechanism" has been included in these models (P. 805).

### ADJUSTMENTS:

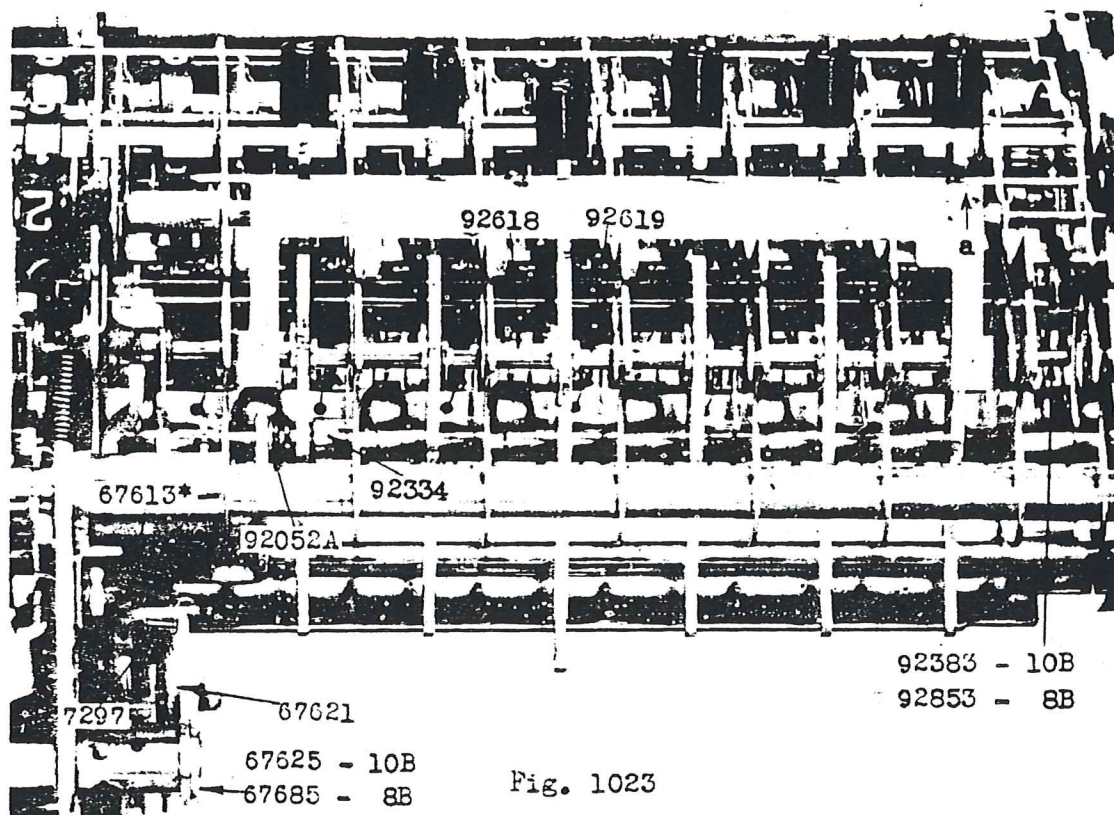
The throw of Selective Position Lever 67625 (67685 on 8 banks) is adjusted by eccentric 67621. Figure 1023. This should be set to cause Shift Connecting Link 72024 (Fig. 440, P. 715) to clear Shift Control Lever 72565 (72055 on D machines) by the same amount as in adjusting the shift terminating mechanism.



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## SELECTIVE POSITION RETURN MECHANISM (Cont'd)

(Models: ACR8M, ACR8D, and ACR10D)





**MARCHANT**

**SIMPLIFIED MULTIPLICATION  
RELOCATED RESTORE FUNCTIONS  
RATCHET CLUTCH**

**SERVICE  
INSTRUCTION  
BOOK**

834-843

## MULTIPLIER SELECTION UNIT

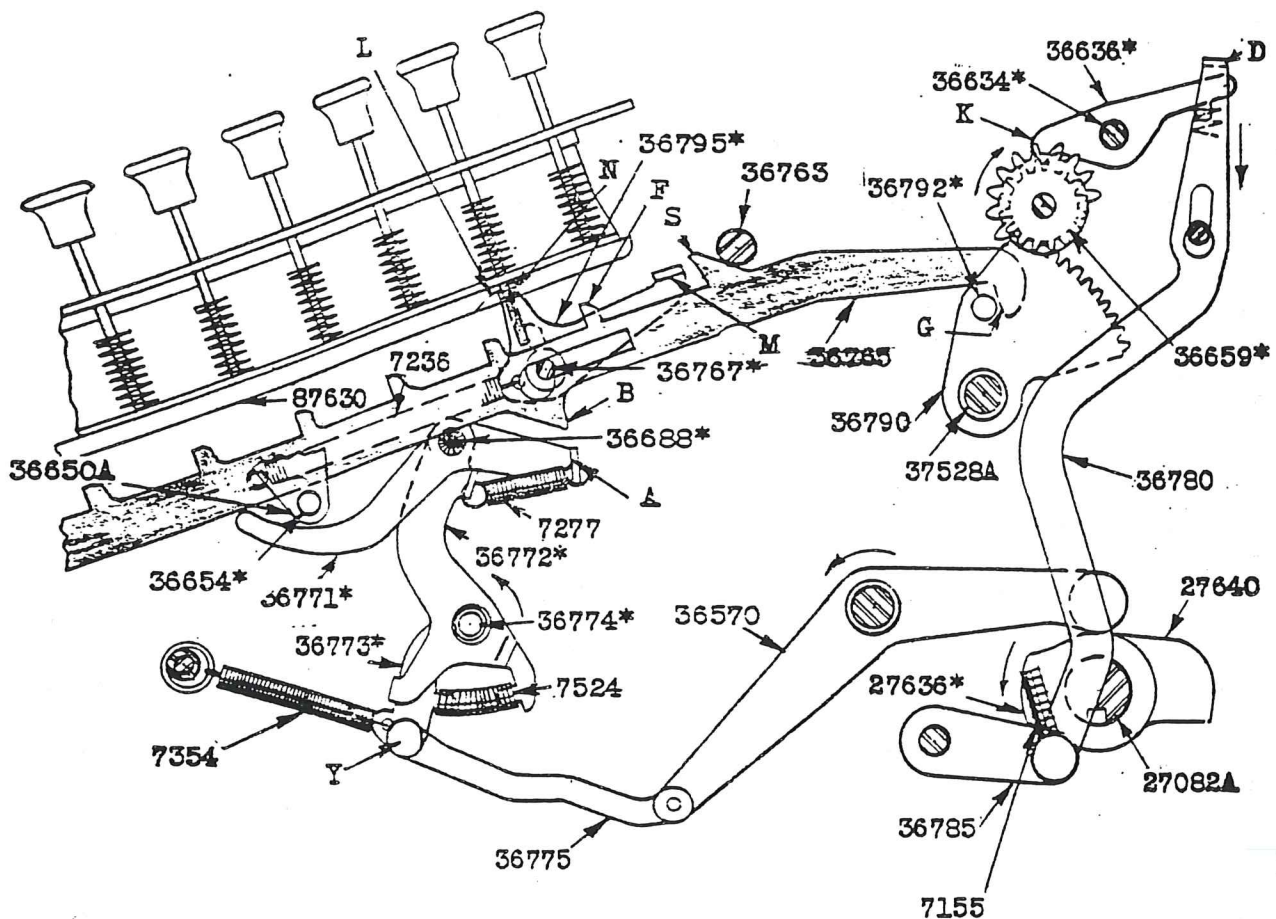


FIG. 1024

1. The Automatic Multiplier Unit has been simplified and improved as herein explained.

2. Depression of any Multiplier Key from No. 2 to No. 9 causes the lower end of the selected key to be placed in a position to be engaged by its corresponding stop lug F on Selection Bar 36765, (Fig. 1024).

3. Depression of any Multiplier Key from No. 1 to No. 9 depresses the Parallel Bar 36650A and Stud 36654 attached thereto. Stud 36654 contacts the forward end of Lever 36771 and rocks said lever about Pivot Stud 36688 on the upper end

of Lever 36772, thus placing ear A directly behind lug B on 36765. At this time the Setting Clutch is released (Pages 603 & 604, Paragraphs 8-12) and rotates Setting Shaft 27082A in the direction indicated. Cam 27640, keyed to Shaft 27082A, rocks Lever 36570 in the direction shown causing Link 36775 to be pulled to the right. Arm 36773, pivoted on Stud 36774, is connected with Arm 36772 which is also pivoted on the same stud by means of Compression Spring 7524, thus forming a yieldable driving connection between these two arms 36772 and 36773, which in turn is connected with Link 36775 at Y. The rightward



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## MULTIPLIER SELECTION UNIT (Cont'd)

movement of Link 36775 rocks Yieldable Lever Assembly 36773 and 36772 in the direction indicated, thus causing the leftward movement of Lever 36771. Ear A on Lever 36771 which is normally held in its most clockwise position by Spring 7277 now contacts lug B and moves Selection Bar 36765 leftward until stopped by the Selected Multiplier Key coming into contact with its stop lug F on 36765. Continued rearward movement of 36775 is absorbed by the Compression Spring 7524 forming the yield between Levers 36772 and 36773.

4. The stop lugs F on the Selection Bar 36765 are equally spaced at slightly longer intervals than those between the equally spaced Multiplier Keys, therefore, each Multiplier Key is spaced one unit further away from its corresponding stop lug than the key immediately to the left of one less numerical value.

5. The leftward movement of Selection Bar 36765, against the tension of Spring 7236, causes surface G to contact Stud 36792 on Multiplication Selection Segment 36790 and rotate this segment an amount equal to the value of the depressed Multiplier Key.

6. Cam 27636 keyed to Shaft 27082A rocks Cam Follower 36785 downward, thus lowering Link 36780, causing ear D to contact Pawl 36636 pivoted on Stud 36634 and rock pawl tooth K from engagement with Gear 36659; thus permitting Gear 36659 to be freely actuated by Segment 36790 an amount depending on the value of the depressed Multiplier Key.

7. When the above selection is completed the Pawl 36636 is re-

leased and locks Gear 36659 in the selected position.

8. Latch 36795, pivoted on frame Stud 36767, is urged by Spring 7236 to keep ear M located in front of lug S on 36765, thus preventing an erroneous operation of the Selection Bar 36765 if a Multiplier Key should accidentally be partially depressed while the Setting Clutch is in operation due to the depression of some other operating control bar. Forward movement of the Lock Bar causes notch L to force ear N forward thus raising ear M from the path of lug S, thus assuring full key stroke before Selection Bar 36765 is allowed to be released into operation.

9. Clockwise rotation of Lever 36235A (Fig. 1025), on depression of the Add Bar, causes Stud 36233 to contact surface A on Link 36231 and move said link in a leftward direction. Link 36231 is attached to Operating Bar 36140 by Stud 36148, therefore, 36140 is rocked in a downward rearward direction to effect the opening of the Setting Clutch. (Page 436, Paragraph 5).

10. The depression of a Multiplier Key causes Parallel Bar 36650B (Fig. 1025) to be lowered, thus rocking Arm 36665B about Adjustable Stud 36651 and raising Roller 36671 into position to intercept the counter-clockwise rotation of Parallel Bar Return Lever 36653. Link 36368 is connected with Lever 36653 by means of Spring 7603 and Spring Link 36673, therefore the rightward movement of Link 36368 (Paragraph 6, Page 618) rocks surface B on 36653 into contact with Roller 36671 on Arm 36665B and tensions Spring 7603. The release of the Multiplier Key, during the

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## MULTIPLIER SELECTION UNIT Contr'd

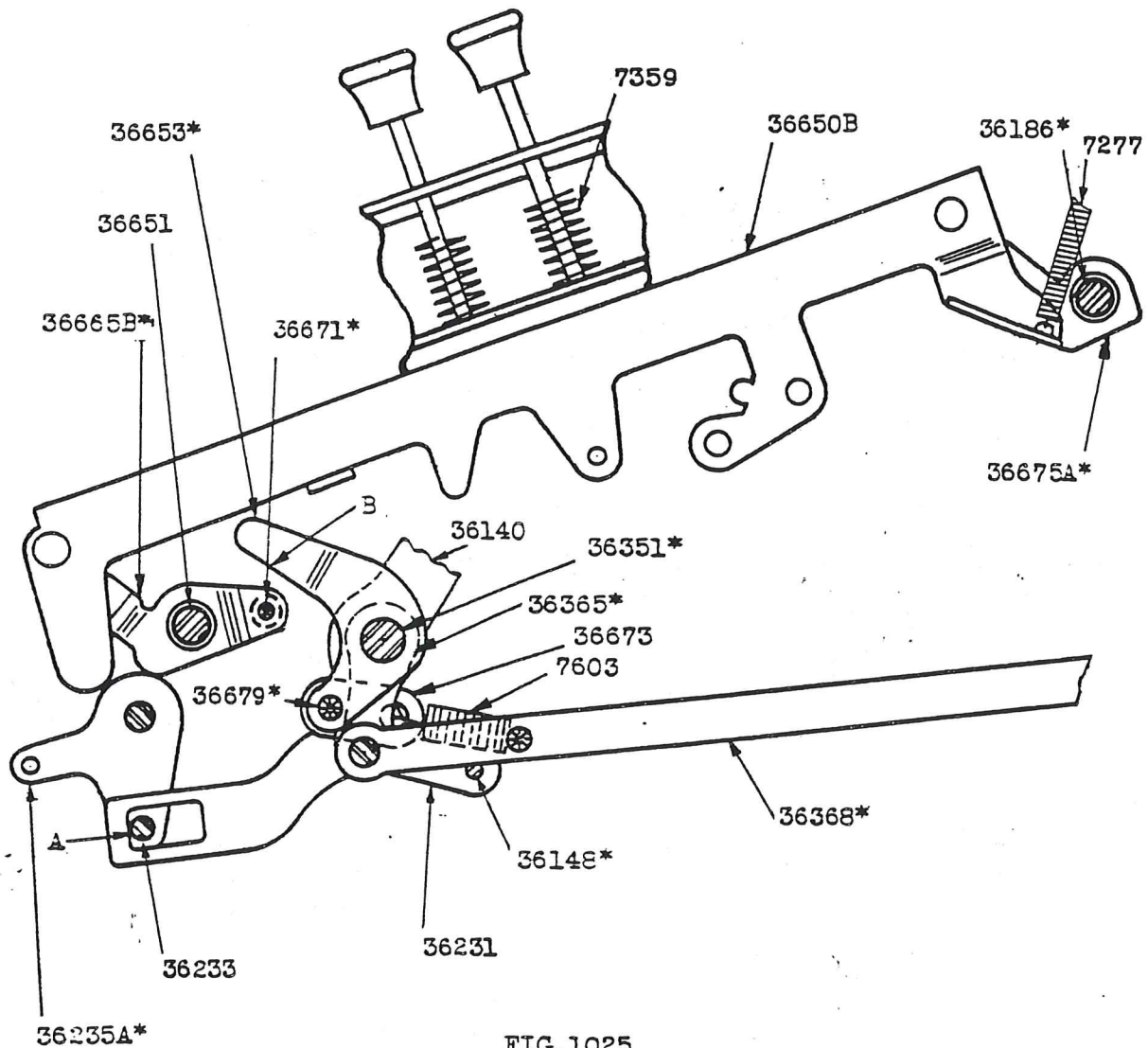


FIG. 1025

time that 7603 is extended under tension, permits Parallel Return Bar Lever 36653 to continue its counter-clockwise rotation, thus rocking Arm 3665B in a clockwise

direction and assisting Springs 7277 and 7359 to restore the Parallel Bar and Multiplier Keys to their raised positions.



# MARCHANT

## MULTIPLIER TRIP UNIT

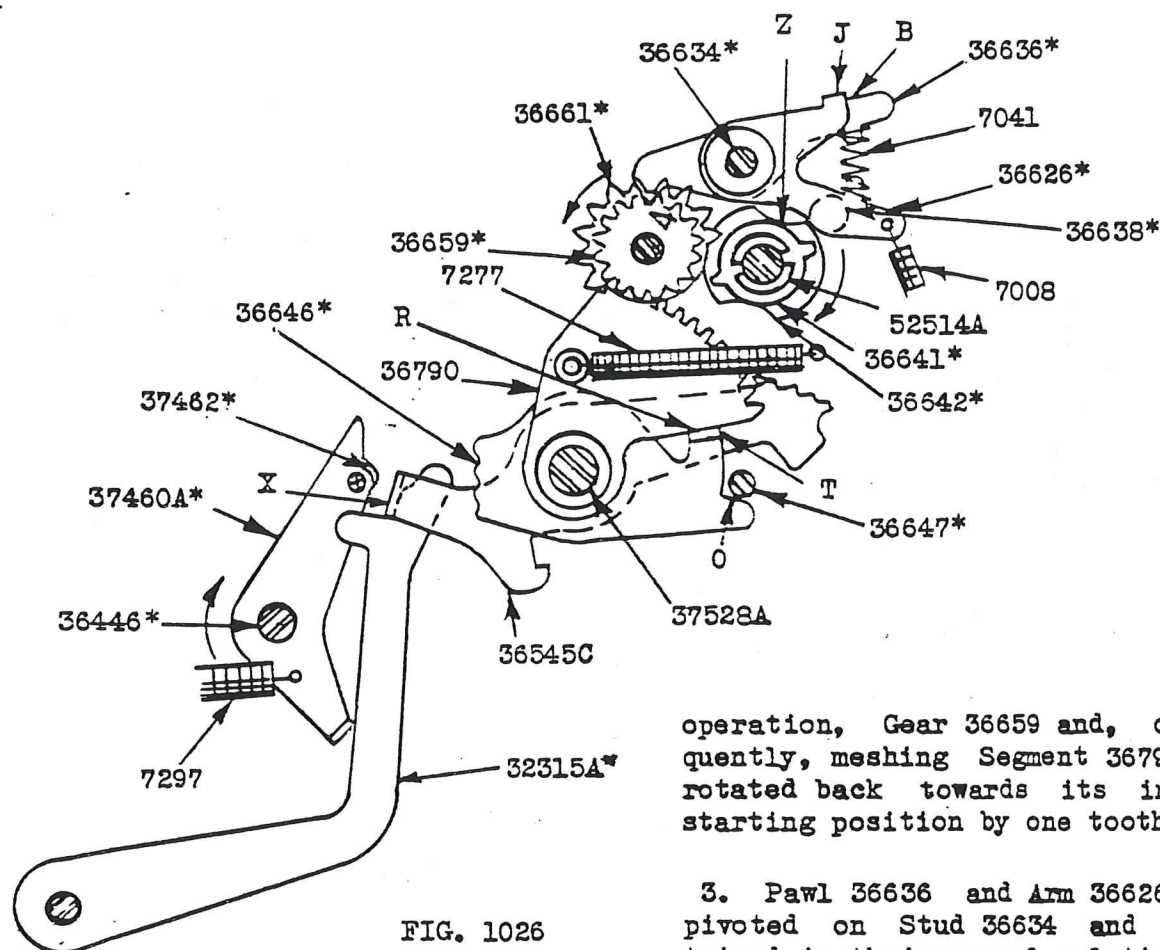


FIG. 1026

1. When the Multiplier Selection Unit has positioned the Trip Segment Drive Gear 36659, in accordance with the depressed Multiplier Key, the Trip Unit transmits the selection to the Actuator in the following manner.

2. Engagement of the Main Clutch (Paragraph 7, Page 432) rotates Clutch Bearing 52514A (Fig. 1026) and two tooth Trip Gear 36641 keyed thereto in a clockwise direction. This gear in turn advances an assembly consisting of Gears 36659, and 36661 in a tooth by tooth fashion. The arrangement being such that for each cycle of main clutch

operation, Gear 36659 and, consequently, meshing Segment 36790 is rotated back towards its initial starting position by one tooth.

3. Pawl 36636 and Arm 36626 are pivoted on Stud 36634 and maintained in their normal relative position by Compression Spring 7041. Roller 36638 on Arm 36626 is held in contact with Cam 36642, keyed to Bearing 52514A, by Tension Spring 7008. Rotation of 52514A permits Roller 36638 to drop into cam depression Z simultaneously with the engagement of Gears 36641 and 36661; thus, rocking ear J on Arm 36626, in contact with surface B on Pawl 36636, and effecting the disengagement of Pawl 36636 from Gear 36659 during the time that Gear 36661 is being driven by the two tooth Gear 36641 on the Main Clutch Assembly.

4. Centralizer Unlatching Arm 32315A has been slightly changed but is still rocked by Main Clutch Release Dog 36545C (Fig. 1026).

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## MULTIPLIER TRIP UNIT (Cont'd)

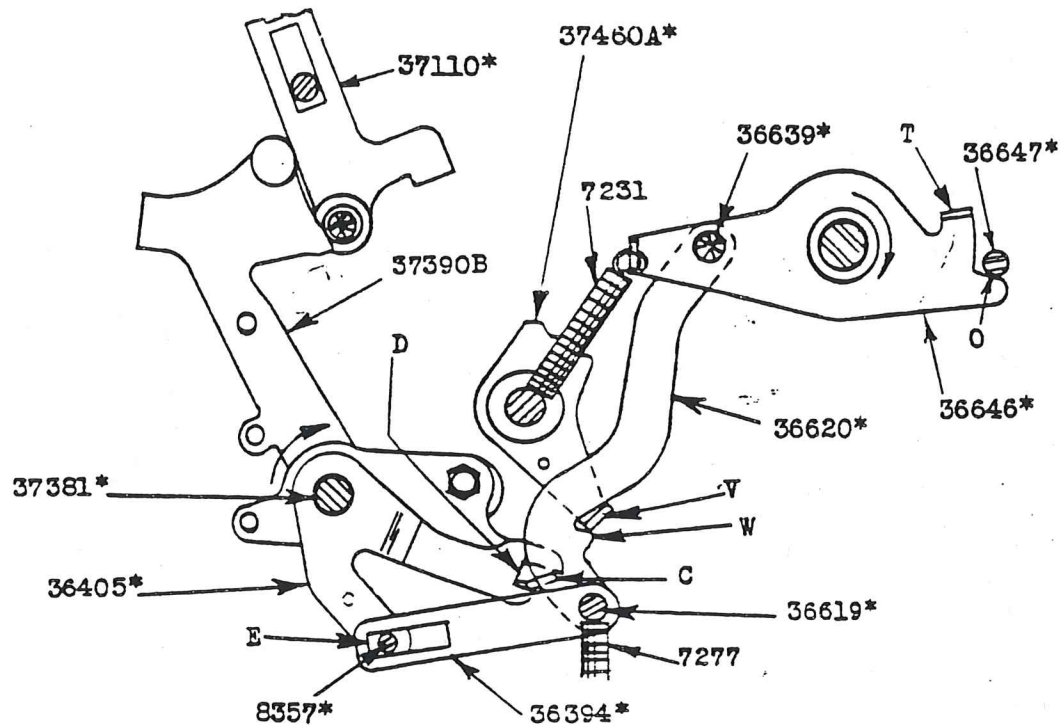


FIG. 1027

5. As Segment 36790 approaches its initial position surface R contacts ear T on Lever 36646, thereby rocking Lever 36646 about Shaft 37528A in the direction indicated (Fig. 1027) and causing Link 36620, connected with Lever 36646 by Stud 36639, to be raised.

6. The upward movement of Link 36620 causes surface W to contact ear V on Latch 37460A and rock said Latch about Shaft 36446 (Fig. 1026) against the action of Spring 7297, thus disengaging Roller 37462 on 37460A from beneath ear X on Main Clutch Release Dog 36545C to effect the stopping of the Main Clutch.

7. The Lever 36646 is held in its normal position, with surface O contacting Stud 36647 on the right side frame, by the counter-clockwise urge of Spring 7231.

8. Depression of the Division Key 37110 (Fig. 1027) and subsequent rocking of Lever 37390B (Para. 12, Page 459) in the direction indicated, acts through adjustable ear C on 37390B and notch D in lever 36405, to rotate 36405 on Shaft 37381. The above rotation causes Stud 8357 on Lever 36405 to contact the leftward edge of slot E in Link 36394. The leftward movement of 36394 rocks Link 36620, pivoted on 36394 by Stud 36619, about Stud 36639; thus holding surface W out of contact with ear V and permitting Latch 37460A to latch Clutch Dog 36545C as previously explained.

9. With Segment 36790 in its extreme clockwise position, i.e., with a zero selection, the nose of Pawl 36636 should be positioned in the tooth space adjacent to the vertex of the numeral four identification mark, (Fig. 1026).



# MARCHANT

## RESTORE FUNCTIONS

1. The Restore Mechanism has been redesigned to receive its actuating force from the rotation of the Setting Clutch, resulting in elimination of the Restore Clutch and further simplification and improvement of the machine.

2. The above has been accomplished by increasing the rotation of the Setting Clutch 52525A to one revolution per machine cycle. The first half revolution of said clutch operates the setting mechanism as explained in the Model "D" Service Instruction Book. The second half revolution is utilized to actuate the restore mechanism as herein-after explained. The Setting Cams are so contoured that during the restore phase of the Setting Clutch their respective followers are caused to dwell.

3. With the Main Clutch Release Dog disengaged from the Main Clutch and held latched by 37460A, as illustrated in Fig. 1028, Lever 36576 is rocked to its extreme clockwise position by the ear A on 36545C which contacts the lateral ear B of 36576. In this position Roller 36574 is held clear of Cam 27201. The counter-clockwise rotation of Main Clutch Release Dog 36545C, subsequent to the withdrawal of Latch 37460A at the end of the Main Clutch cycle, allows Spring 7050 to rock Clutch Control Lever 36576 counter-clockwise and permits lateral ear B to disengage surface A. The upward movement of said lever causes surface C thereon to contact

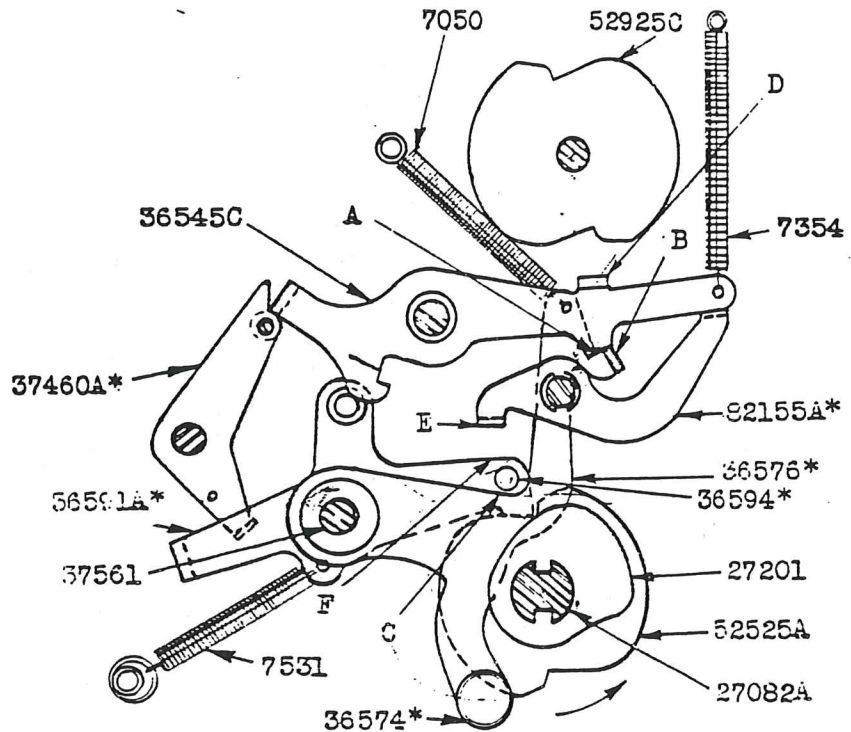


FIG. 1028

Stud 36594 on Setting Clutch Dog 36591A and rock said Dog from engagement with Setting Clutch 52525A, thus initiating the restore phase of the Setting Clutch.

4. The rocking of Dog 36591A, as explained above, causes surface F thereon to contact ear E on Switch Control Lever 82155A (Fig. 1028) and rock said lever in a clockwise direction to effect the starting of the motor. (Paragraph 5, Page 428).

5. During the setting phase rotation of the Setting Clutch, cams 27206 (Fig. 1030) actuate Followers 27145C and 27150B to pull down on Links 27155B and 27167A, thus dipping the lower carriage. The carriage is held in its dipped position by the high point in the contour of Cam 27206 being positioned

MULTIPLIER TRIP UNIT (Cont'd)

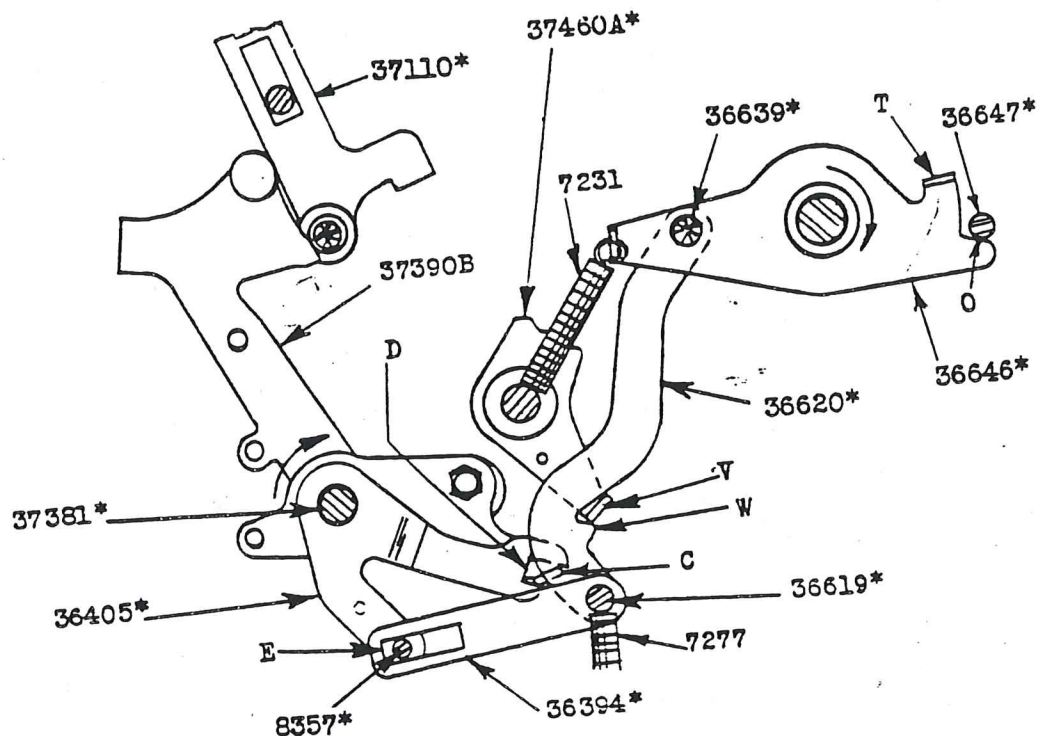


FIG. 1027

5. As Segment 36790 approaches its initial position surface R contacts ear T on Lever 36646, thereby rocking Lever 36646 about Shaft 37528A in the direction indicated (Fig. 1027) and causing Link 36620, connected with Lever 36646 by Stud 36639, to be raised.

6. The upward movement of Link 36620 causes surface W to contact ear V on Latch 37460A and rock said Latch about Shaft 36446 (Fig. 1026) against the action of Spring 7297, thus disengaging Roller 37462 on 37460A from beneath ear X on Main Clutch Release Dog 36545C to effect the stopping of the Main Clutch.

7. The Lever 36646 is held in its normal position, with surface O contacting Stud 36647 on the right side frame, by the counter-clockwise urge of Spring 7231.

8. Depression of the Division Key 37110 (Fig. 1027) and subsequent rocking of Lever 37390B (Para. 12, Page 459) in the direction indicated, acts through adjustable ear C on 37390B and notch D in lever 36405, to rotate 36405 on Shaft 37381. The above rotation causes Stud 8357 on Lever 36405 to contact the leftward edge of slot E in Link 36394. The leftward movement of 36394 rocks Link 36620, pivoted on 36394 by Stud 36619, about Stud 36639; thus holding surface W out of contact with ear V and permitting Latch 37460A to latch Clutch Dog 36545C as previously explained.

9. With Segment 36790 in its extreme clockwise position, i.e., with a zero selection, the nose of Pawl 36636 should be positioned in the tooth space adjacent to the vertex of the numeral four identification mark. (Fig. 1026).



# MARCHANT

## RESTORE FUNCTIONS

The Restore Mechanism has been redesigned to receive its actuating force from the rotation of the Setting Clutch, resulting in the elimination of the Restore Clutch and further simplification and improvement of the machine.

The above has been accomplished by increasing the rotation of the Setting Clutch 52525A to one revolution per machine cycle. The first half revolution of said clutch operates the setting mechanism as explained in the Model "D" Service Instruction Book. The second half revolution is utilized to actuate the restore mechanism as herein-after explained. The Setting cams are so contoured that during the restore phase of the Setting Clutch their respective followers are caused to dwell.

3. With the Main Clutch Release Dog disengaged from the Main Clutch and held latched by 37460A, as illustrated in Fig. 1028, Lever 36576 is rocked to its extreme clockwise position by the ear A on 36545C which contacts the lateral ear B of 36576. In this position Roller 36574 is held clear of Cam 27201. The counter-clockwise rotation of Main Clutch Release Dog 36545C, subsequent to the withdrawal of Latch 37460A at the end of the Main Clutch cycle, allows Spring 7050 to rock Clutch Control Lever 36576 counter-clockwise and permits lateral ear B to disengage surface A. The upward movement of said lever causes surface C thereon to contact

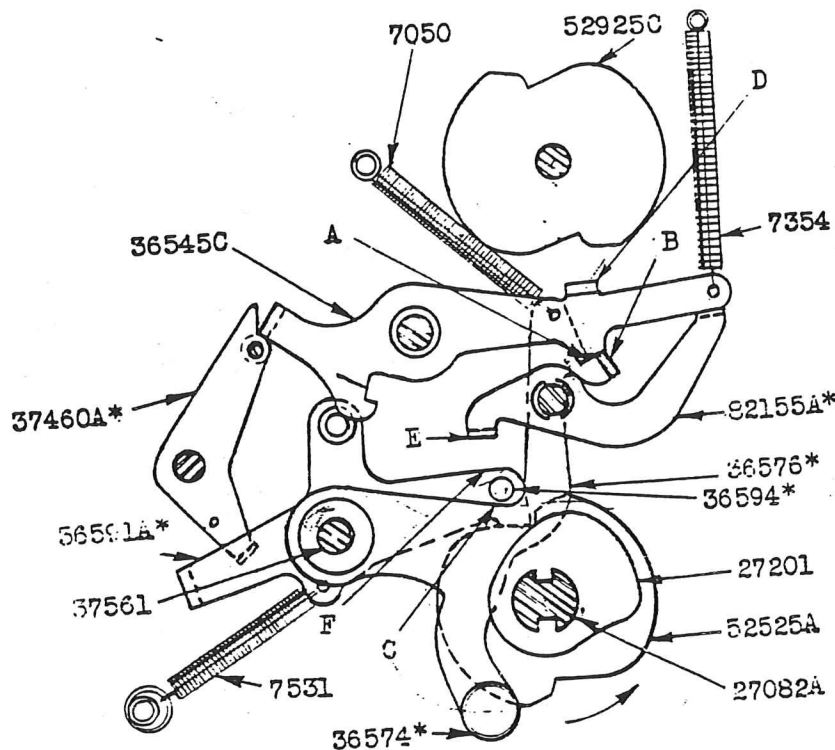


FIG. 1028

Stud 36594 on Setting Clutch Dog 36591A and rock said Dog from engagement with Setting Clutch 52525A, thus initiating the restore phase of the Setting Clutch.

4. The rocking of Dog 36591A, as explained above, causes surface F thereon to contact ear E of Switch Control Lever 82155A (Fig. 1028) and rock said lever in a clockwise direction to effect the starting of the motor. (Paragraph 5, Page 428).

5. During the setting phase rotation of the Setting Clutch, cam 27206 (Fig. 1030) actuate Followers 27145C and 27150B to pull down on Links 27155B and 27167A, thus dipping the lower carriage. The carriage is held in its dipped position by the high point in the contour of Cam 27206 being positioned

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## RESTORE FUNCTIONS (Cont'd)

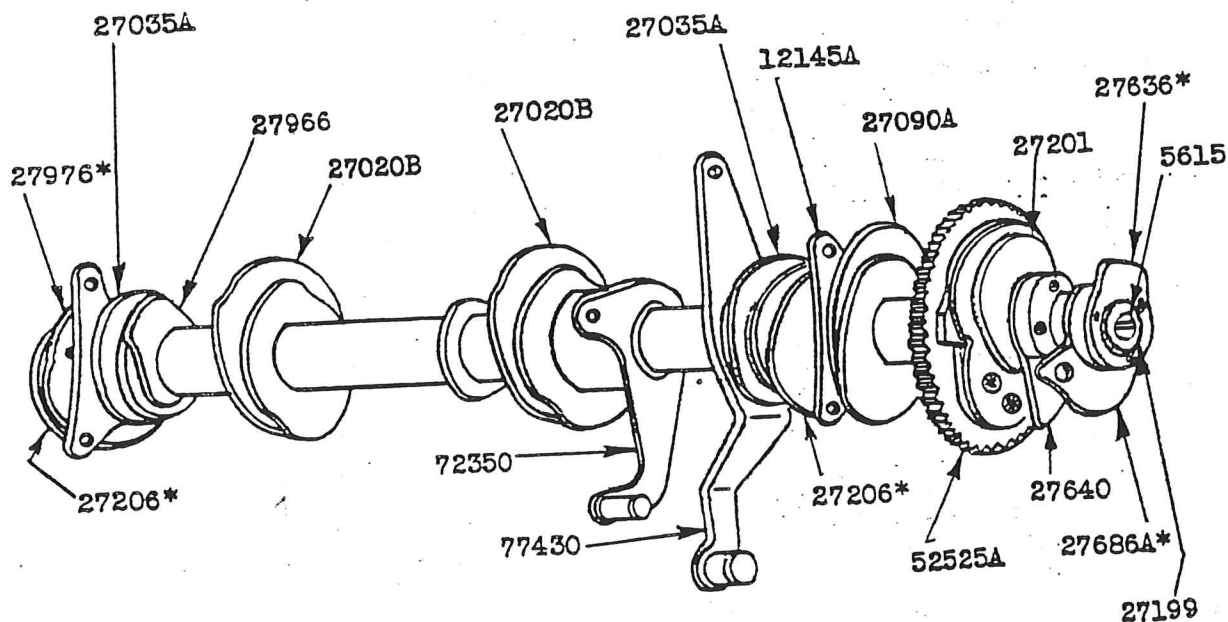


FIG. 1029

under the Roller 9188 during the cycling of the main clutch. Rotation of Cam 27206, during the restore phase of the setting clutch cycle, permits Spring 7584 to raise the Links 27155B and 27167A, thus returning the lower carriage to its normal position. The upward movement of the carriage is controlled by the gradual return of Roller 9188 to the low point in the contour of Cam 27206.

6. During the setting phase of the Setting Clutch, Cam 27976 (Fig. 1030) actuates Follower 27170 to effect the disengagement of the Pivot Gear Pawls 32202 (Paragraph 14, Page 411) and maintains them in this position during the main clutch operation. The restore phase then permits Spring 7094 to rock the Follower 27170 in a clockwise direction and cause the pawls to reengage Pivot Gears 32142.

7. Division Restore Link 37421A (Fig. 1031) is slidably mounted on

7634 Right  
7584 Left

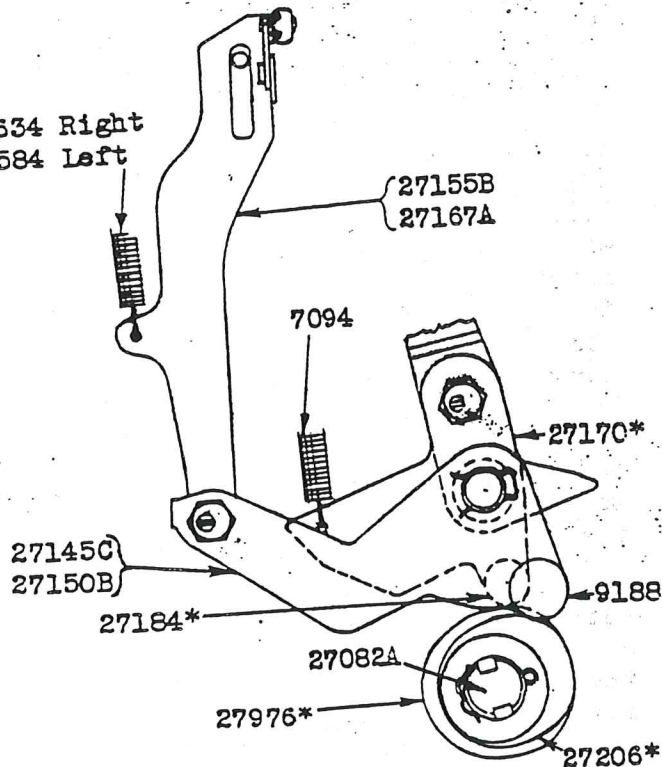


FIG. 1030  
VIEW FROM LEFT



## RESTORE FUNCTIONS (Contr'd)

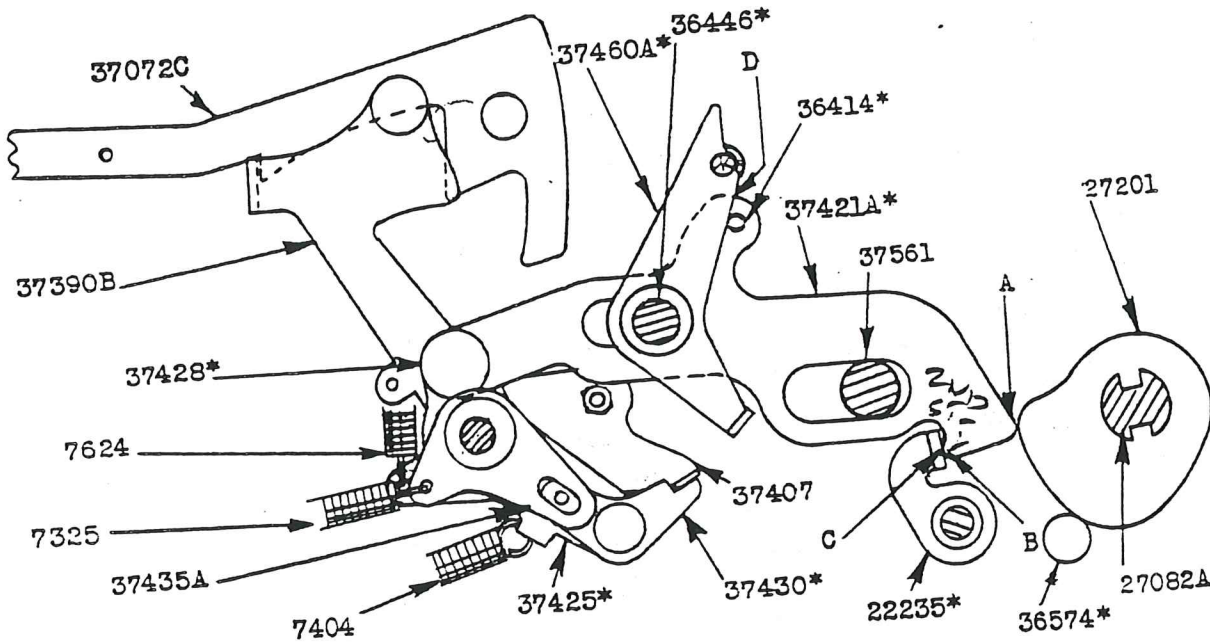


FIG. 1031

Shaft 37561 and pivoted to Lever 37425 by Stud 37428 with surface A held in contact with Cam 27201 by the tension of Spring 7404. During the restore phase of the Setting Clutch, Cam 27201 actuates the Link 37421A in a leftward direction thereby recocking the Division Operating Lever 37390B in the manner described on page 463, paragraph 24. Surface B on Link 37421A contacts ear C on Division Control Restore Lever 22235 and actuates said lever in a manner also described on page 463, paragraph 24. The leftward movement of 37421A causes Stud 36414, attached thereto, to contact surface D of Latch 37460A and rock said Latch a sufficient overstroke to insure the latching of ear V over surface W on 36620, (Fig. 1027).

8. Sensing Retracting Cam 27966 (Fig. 1032) actuates Lever 22625 in a counter-clockwise direction, thereby lowering notch J and rocking Sensing Release Lever 22630A about Shaft 22135 against the action of Tension Spring 7276. Tip K contacts surface M on Carriage Sen-

sing Lever Assembly 22980A and rocks this assembly about Hinge Pin 22099A in a counter-clockwise direction, thus causing surface N on Sensing Lever 22976 to contact Sensing Lever Stop Shaft 22092A and be rocked about Pivot Stud 22068A in a clockwise direction far enough to allow the carry wave to go through.

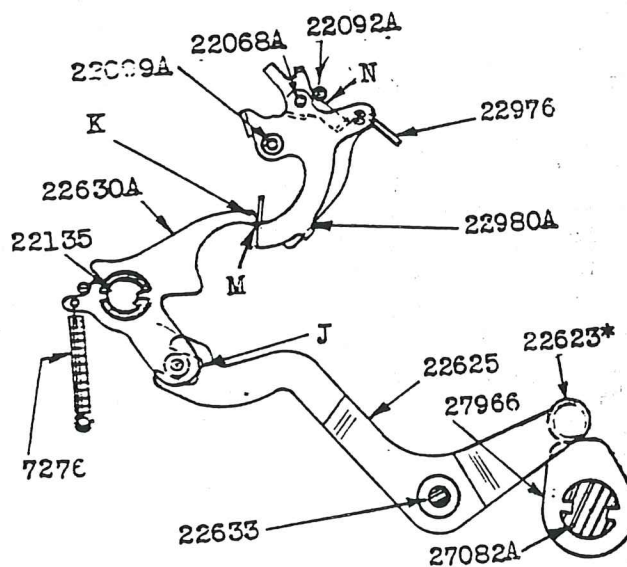


FIG. 1032

# MARCHANT

## RATCHET CLUTCHES

1. To eliminate certain manufacturing difficulties, a new ratchet type clutch has been designed to replace the roller type main and setting clutches formerly used.

### Main Clutch 52925C

2. Clutch Drive Gear 52529A and Ratchet 52921, keyed thereto (Fig. 1034), rotate in a clockwise direction continuously with the operation of the motor. (Paragraphs 2 and 3, Page 430).

3. During operations not requiring the rotation of the Main Clutch the ear A on Clutch Dog 36545C is located, under tension of Spring 7354 in one of two notches in Disc 52915B, keyed to Bearing 52514A,

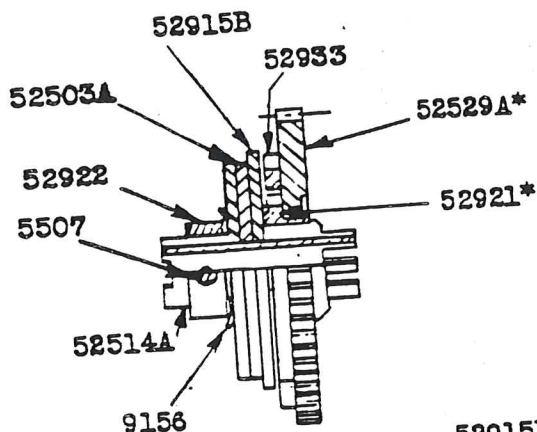


FIG. 1033  
MAIN CLUTCH

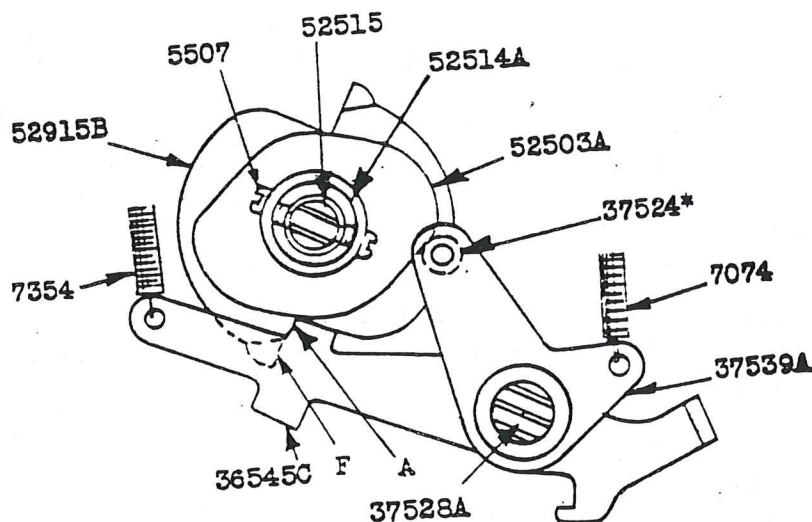


FIG. 1035  
VIEW FROM LEFT

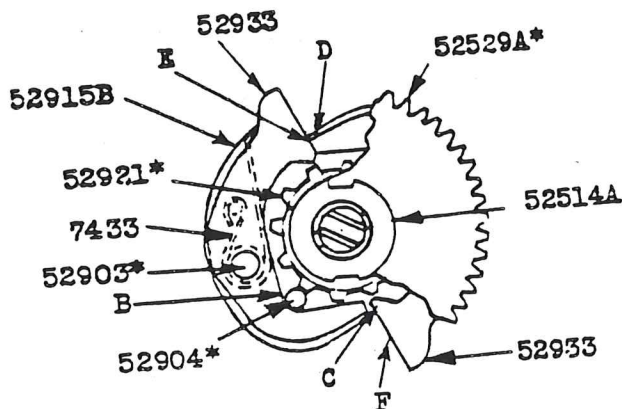


FIG. 1034

(Fig. 1035) and exerts a pressure against surface F on Dog 52933 equal to the counter-action of Spring 7074 acting through Centralizer 37539A and Cam 52503A, also keyed to 52514A. The above spring action is stronger than that exerted by Torsion Spring 7433, therefore, Dog 52933 is rocked about Stud 52903 on Disc 52915B causing nose C to be rocked clear of Ratchet 52921.



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## RATCHET CLUTCHES (Cont'd)

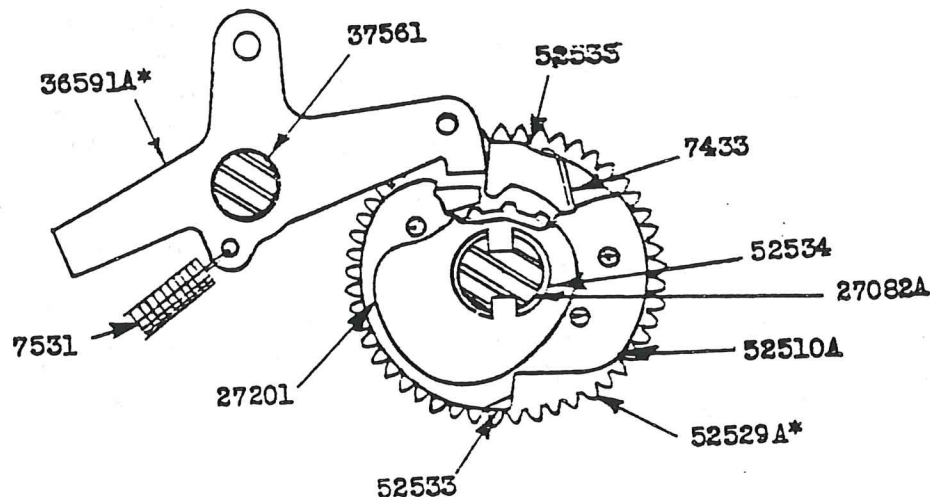


FIG. 1036  
SETTING CLUTCH

4. The rotation of one Dog 52933 causes its tail D to contact the nose E of the second Dog, thus rotating the second dog and effecting the simultaneous disengagement of the two dogs from Ratchet 52921. The rotation of the dogs is limited by surface B coming in contact with Stud 52904.

5. With the dogs in the above position the Drive Gear and Ratchet Assembly rotates freely on Bearing 52514A until such time as the Main Clutch Dog 36545C is withdrawn (Paragraph 7, Page 432).

6. Withdrawal of Release Dog 36545C permits Spring 7433 to rock

Dog 52933 about Stud 52903 and cause nose C to engage Ratchet 52921. The rotation of Drive Gear 52529A is then transmitted through Ratchet 52921, Dog 52933, and Disc 52915B to Bearing 52514A and thereby to the Actuator.

### Setting Clutch 52525A

1. The Setting Clutch (Fig. 1036) is operationally identical with the Main Clutch. Bearing 52534 is keyed directly to Setting Line Shaft 27082A. Cam 27201, though shown as a unit part of the Setting Clutch Assembly, is functionally a part of the restore mechanism and its operation is explained thereunder.

# MARCHANT

## NORMAL LEFT SHIFT SERVICE INSTRUCTION BOOK

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850-855



# MARCHANT

## NORMAL LEFT SHIFT

1. The three Shift Direction Control Keys for the ACRM and ACTM models have been re-designed so that with all three keys up, or the upper (left auto. shift) Key 72630\* latched, the Carriage will automatically shift to the left after depressing any of the Auto. Multiplier Keys, and on the ACRM model the Tee 77371\* will be positioned for a right shift. When the lower (right auto. shift) Key 72620\* is latched, the Carriage will automatically shift to the right following a depression of any of the Auto. Multiplier Keys, and 77371\* will be set for a left shift. The mechanism involved and the action due to the depression and latching of the Non Shift Key 72655\* is the same as described under "Shift", page 614, paragraph 6, except that a left shift is obtained by depressing the Zero Multiplier Key. Simultaneous depression of the lower Key 72620\* and Non Shift

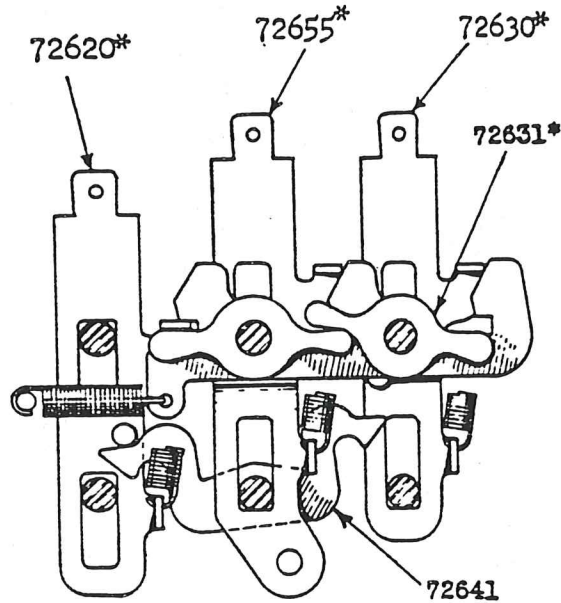


FIG. 1040

Key 72655\*, or the upper Key 72630\*, and Non Shift Key 72655\* is prevented by Interlocks 72631\*. Interlock 72641 prevents the lower Key 72620\*, and the upper Key 72630\* from being depressed simultaneously. Fig. 1040.

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## NORMAL LEFT SHIFT (Cont'd)

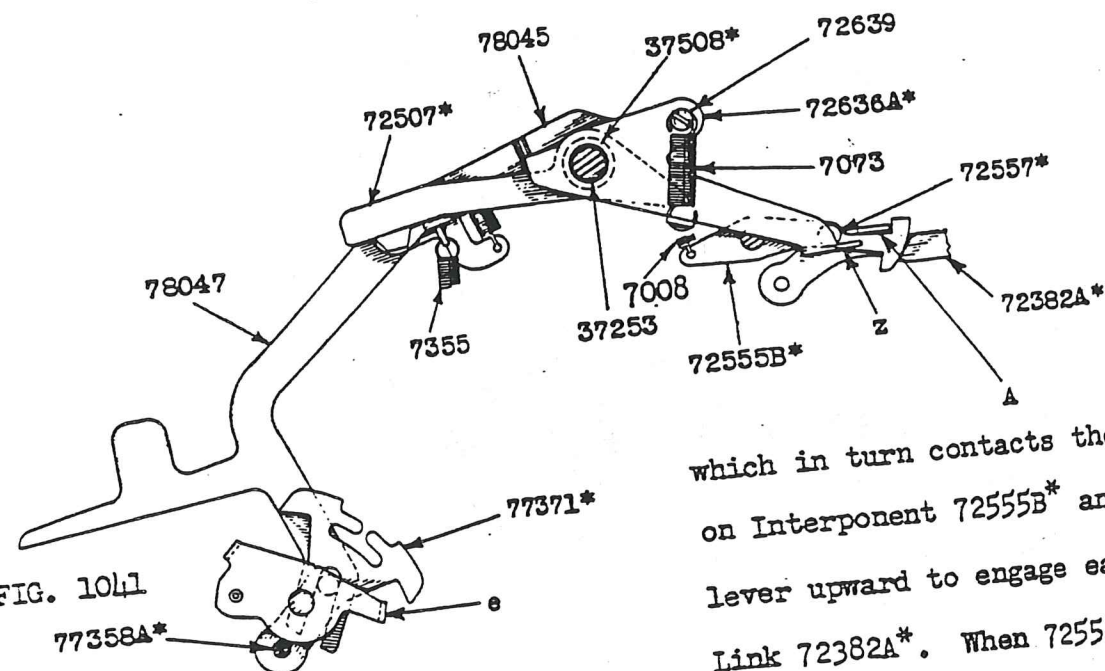


FIG. 1041

When all the Shift Direction Control Keys are up or the upper Key 72630\* is latched, the Shift Direction Control Lever 72636A\* is pivotally mounted on Hub 37508\* with the Shift Actuator Lever 72507\* and connected to that lever by means of the Yield Spring 7073 and the Tee Positioning Lever 78045, to which 72636A\* is fastened, by means of screw 72639, are free to be rocked counter-clockwise about the Tie Bolt 37253 by the Spring 7355 fastened to Lever 78045. As 72636A rocks counter-clockwise it raises the shelf "z"

which in turn contacts the Stud 72557\* on Interponent 72555B\* and rocks that lever upward to engage ear "A" on Link 72382A\*. When 72555B is moved forward by the Carriage rise ( See "Shift", page 613, paragraph 2), it will pull Link 72382A\* forward to actuate a left shift. Also since lever 78045 has been rocked counter-clockwise by Spring 7355, the Lever 78047 fastened to 78045 rocks the Tee 77371\* rearward about Stud 77358A\* to position it over ear "e" for a right shift. Fig. 1041. The only direct action due to depressing the upper Key 72630\* is to release either 72655\* or 72620\* from the latched position. Fig. 1041.



NORMAL LEFT SHIFT (Cont'd)

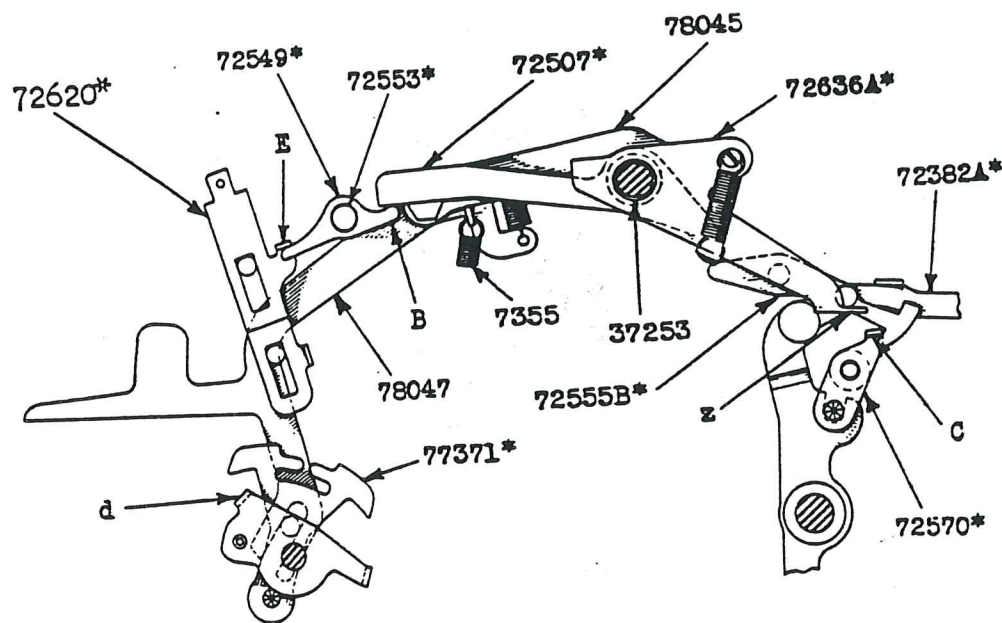


FIG. 1042

3. Upon depression of the lower Shift Control Key 72620\*, the ear "E" is lowered and the Auxiliary Lever 72549\* is rocked counter-clockwise about the Hub 72553\* so that the rear arm "B" underlying the Actuating Lever 72507\* is raised and rocks that lever clockwise, against the action of Spring 7355 on Lever 78045, about the Tie Bolt 37253. This movement lowers shelf "z" and the Interponent 72555B\*, under the tension of Spring 7008 (Fig. 1041), is rocked clockwise

until it engages ear "C" of the Right Shift Lever 72570\*. When Interponent 72555B\* is moved forward by the Carriage rise it will pull ear "C" forward causing the Link 72382A\* to move rearward and actuate a right shift. Since Lever 72507 is rocked clockwise, the Tee Positioning Lever 78045, fastened to 72636A\*, is also rocked in that direction causing the lower end of Lever 78047 to be raised and position the Tee 77371\* forward over ear "d" for a left shift.

Fig. 1042.

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## NORMAL LEFT SHIFT (Cont'd)

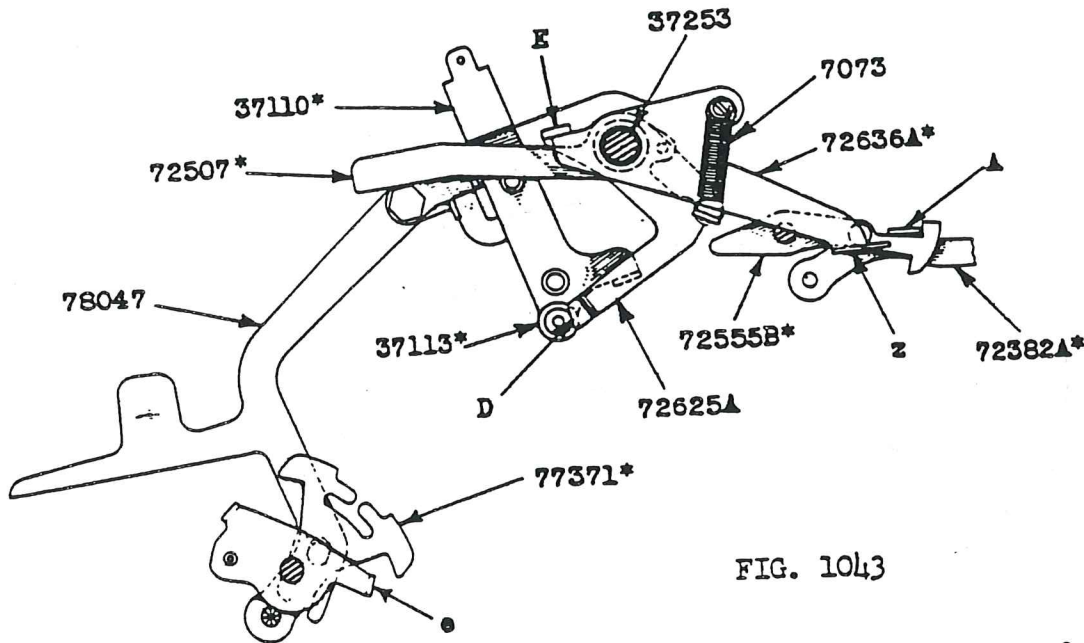


FIG. 1043

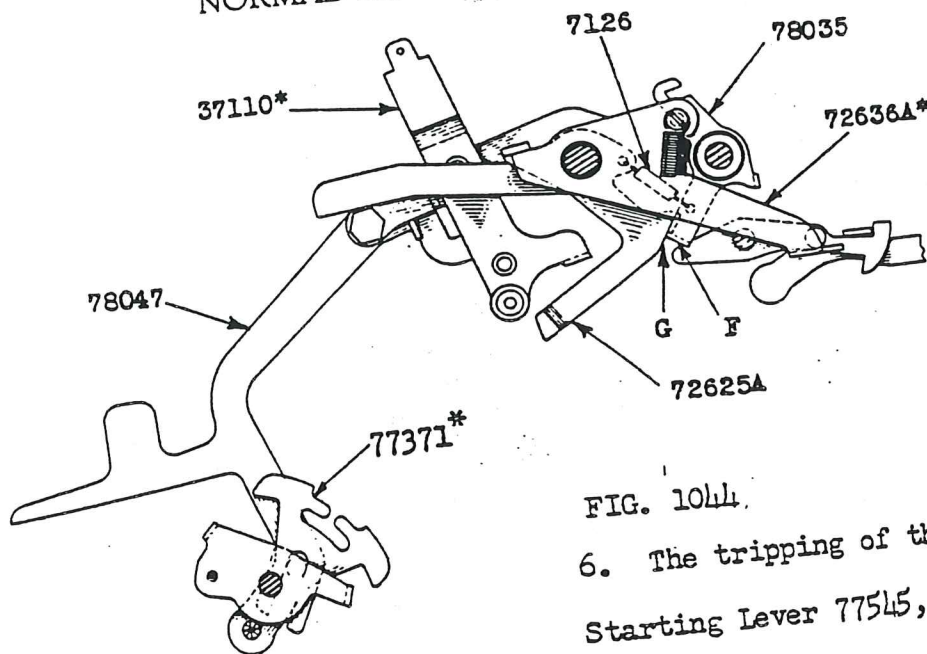
If the lower control Key 72620\* remains latched as in Fig. 1042, all shifts, as obtained by depressing the Clear Return Key, will be to the left. However, with the "Auto. Clear and Return Mechanism" (See pages 806 to 810 inclusive) a right shift is required at the completion of division. When the Division Key 37110\* is depressed the Roller 37113\* contacts the surface "p" of Positioning Lever 72625A and rocks that lever counter-clockwise about Tie Bolt 37253. The ear "E" on 72625A is lowered, and as it

overlies the forward end of Control Lever 72636A\* that lever is also rocked counter-clockwise extending the Yield Spring 7073 since the Lever 72507\* is prevented from rocking by the latched Key 72620. The shelf "z" is raised and the Interponent 72555B\* engages ear "A" of Link 72382A\* for a left auto shift. Since the Lever 78045 is fastened to 72636A\* the lever 78047 is lowered and the Tee 77371\* is rocked rearward over ear "e" for a right shift. Fig. 1043.



# MARCHANT

## NORMAL LEFT SHIFT (Cont'd)



5. After the completion of the division operation the Division Key 37110\* returns to its normal upward position. This would allow Lever 72625A to rotate clockwise and in so doing release 72636A\*, 78047 and 77371\* to their former positions, which would give a left shift instead of the required right shift. Therefore, a latch is provided. The latch is the Shift Interponent Positioning Lever Latch 78035. Ear "F" of 78035 is spring urged into notch "G" of 72625A by 7126. Fig. 1044.

FIG. 1044

6. The tripping of the Tab.

Starting Lever 77545, which starts a shift, moves the Zero Shift Fork 72585\* counter-clockwise and the rear edge contacts the ear "H" of 78035, thus unlatching 72625A and returning 72636A\* and 78047 to their former position. Fig. 1045.

Ear "H" may be bent as required to give proper movement of Latch 78035.

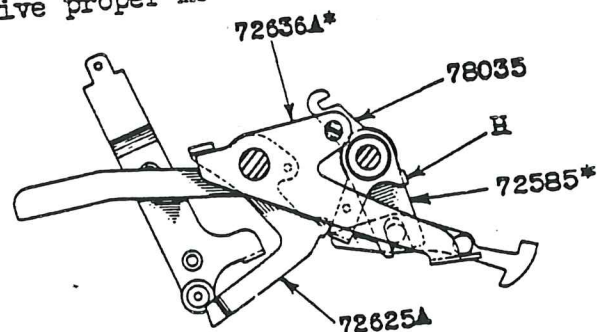
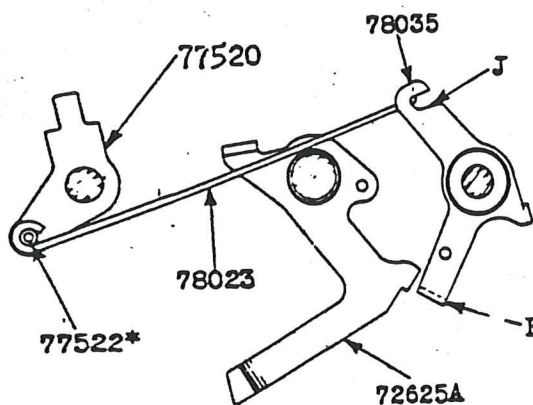


FIG. 1045

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## NORMAL LEFT SHIFT (Cont'd)

7. The "Auto" Clear and Return Mechanism is disabled by rotating Disengaging Lever 77520 rearward as described in "Auto" Clear and Return Mechanism, page 809, Paragraph 9. In addition it is necessary to disable Latch 78035. This is accomplished by wire link 78023. One end of the link is looped about stud 77522\* which is riveted to the lower end of 78020, and the other end is looped through the slot "J" in the upper end of 78035. When 77520 is rocked rearward it rocks ear "F" of 78035 to the rear and so prevents it from latching with 72625A. Fig. 1046.





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**RELOCATED SHIFT KEYS  
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## RELOCATED SHIFT KEYS

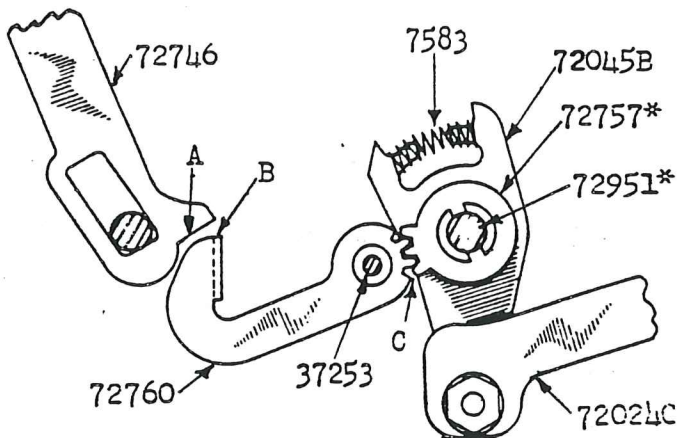


FIG. 1100

1. The Directional Shift Keys have been moved from the extreme right side of the Control Plate to a more convenient location immediately above the Clear Tab. Key.

2. The depression of the Right Shift Key, 72746 causes extension "A" to contact ear "B" on Right Shift Lever Sub Assembly 72760 and rocks that Lever about Tie Bolt 37253. Gear teeth "C" on Lever Assembly 72760 engage the teeth on Right Shift Segment 72757\*, which is pinned to Shift Connecting Shaft 72951\*, and causes this Shaft to rotate in a clockwise direction. Also rotating with Shaft 72951\*, due to action of yield Spring 7583 is Shift Connecting Lever 72045B. Attached to the lower end

of Lever 72045B is Shift Connecting Link 72040C, and as Shaft 72951\* rotates clockwise it causes Link 72040C to move forward and so start a right shift, (see paragraph 2, page 750). Fig. 1100.

3. When the Right Shift Key, 72746 is depressed it rotates Shaft 72951\* and Live Point 72751\* and Lever 72756\* which are pinned to the shaft clockwise. The rotation of Live Point 72751\* is prevented by Stop Stud 36248, consequently Spring 7401 yields to permit 72756\* to rotate and position extension "G" of this under ear "F", thus preventing the depression of the Left Shift Key 72741. Fig. 1101.

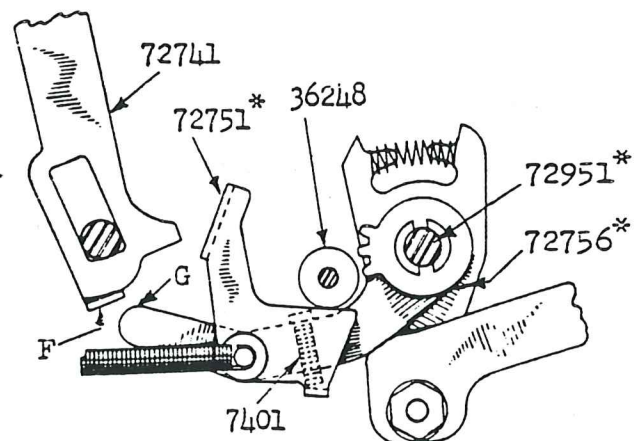
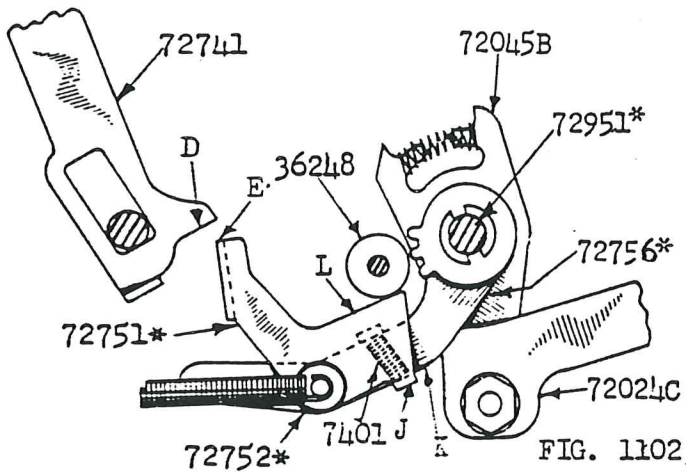


FIG. 1101



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## RELOCATED SHIFT KEYS (Cont'd)



4. Left Shift Live Point, 72751\*, and Left Shift Lever, 72756\*, are loosely riveted together by Stud 72752\*. Ear "J" of Live Point 72751\*, is normally held against surface "K" of Lever 72756\* by Spring 7401, and upon depression of Left Shift Key, 72741, the extension "D" contacts ear "E" on Live Point 72751\* and rocks the assembly of 72751\* and 72756\* (which combined form Shift Operating Lever 72750) in an anti-clockwise direction. Lever 72756\* is pinned to Shaft 72951\*, as is Lever 72045B, and therefore 72045B is also rocked in an anti-clockwise direction and pushes Link 72040C rearward to start a left shift. (See Paragraph 2, Page 750)

Fig. 1102.

5. When the Left Shift Key, 72741, is depressed it rotates the Shaft 72951\* in an anti-clockwise direction. This rotates Segment 72757\*, which is pinned to Shaft 72951\*, in the same direction and the gear teeth meshing with teeth "C" in Lever 72760 rotate that lever about Tie Bolt 37253. The rotation of 72760 places surface "H" under extension "A" of Right Shift Key 72746, thus preventing a depression of that Key.

Fig. 1103.

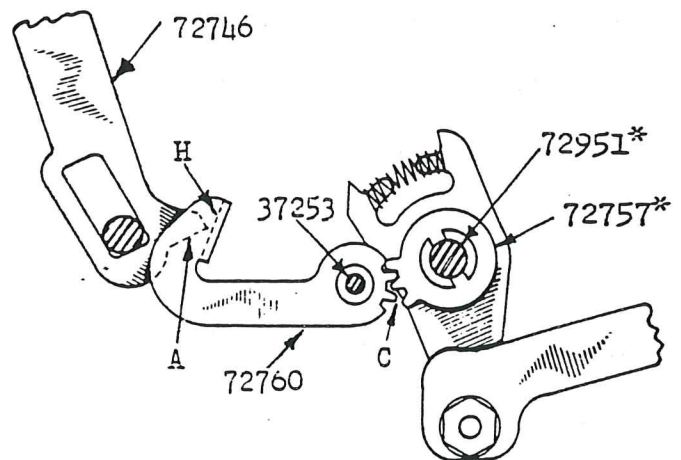


FIG. 1103

## RELOCATED SHIFT KEYS (Cont'd)

6. The Levers 72756\* and 72760 are centralized through Lever 72205\* pinned to the end of Shaft 72951\*, Shift Key Centralizer Fork 72208 and Spring 7354. (See Fig. 1104). When Shaft 72951\* is rotated clockwise, by depression of the Right Shift Key, Lever 72205\* is also rotated clockwise. When 72205\* is rotated and because 72208 is stopped by Eccentric 72209, Spring 7354 is stretched and when the Right Shift Key is released returns Lever 72760 to its neutral position, through 72205\* and Shaft 72951\*.

When the Shaft is rotated anti-clockwise, by depression of the Left Shift Key, 72205\* is also rotated anti-clockwise and Stud 72706\* in slot "M" pushes 72208 upward against Eccentric 72209. Since 72206\* is further from the centre of rotation than the point to which 7354 is attached it is moved further upward, consequently also the point to which 7354 is attached on 72208, therefore 7354 is stretched and when the Left Shift Key is released it returns Lever 72756\* to its neutral position, through 72205\* and Shaft 72951\*.

7. Eccentric 72209 should be adjusted to take all the slack out of 72205\*, Shaft 72951\*, etc.

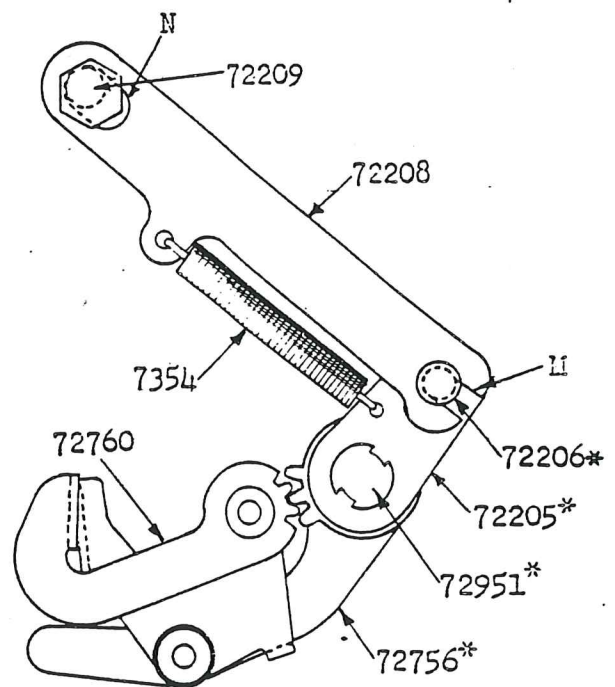


FIG. 1104



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## CONTINUOUSLY READABLE COUNTER

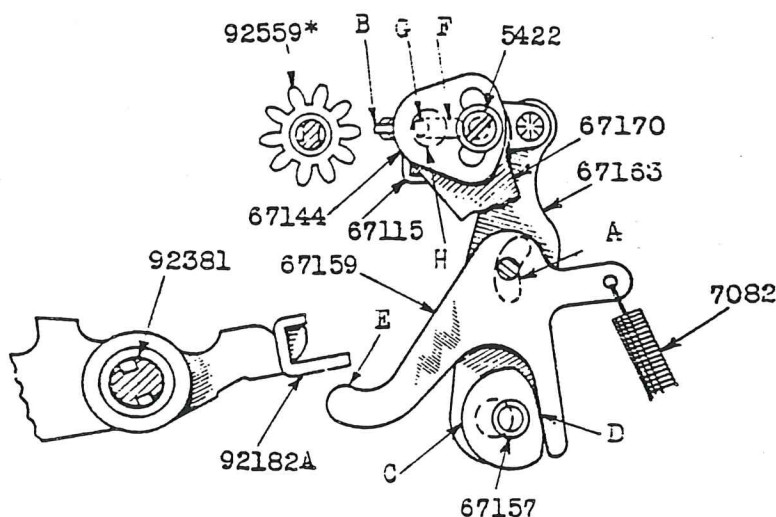


FIG. 1105

1. The counting mechanism has been redesigned to eliminate the planetary gear system of "carry" transfer and with it the fractional displacement of the higher dial orders, thus making it possible to read the dials during calculations.

2. Surface D on Centralizer 67159 is held in contact with cam surface C on Shaft 67157 (Fig. 1105) by Spring 7082 until the dipping of the lower carriage causes Gate 92182A to contact surface E and rock the Centralizer into its in-operative position.

3. Eccentric Shaft 67157 and Actuating Link 67163 (Fig. 1105) prescribe such a path for Transfer Lever Carrier 67115 that finger B contacts and rotates Counting Register Drive Gear 92559\* one tooth in either direction, depending on the position of Shift Pin 67042 (paragraph 4, page 450) for each main clutch cycle.

4. Carrier 67115 is pivoted on Bracket 67170 by means of eccentric pivot stud G on Adjustment Plate 67144. Stud G can therefore be raised or lowered by rotating 67144 about shoulder H, to adjust the stroke of finger B. Fig. 1105.



## CONTINUOUSLY READABLE COUNTER (Cont'd)

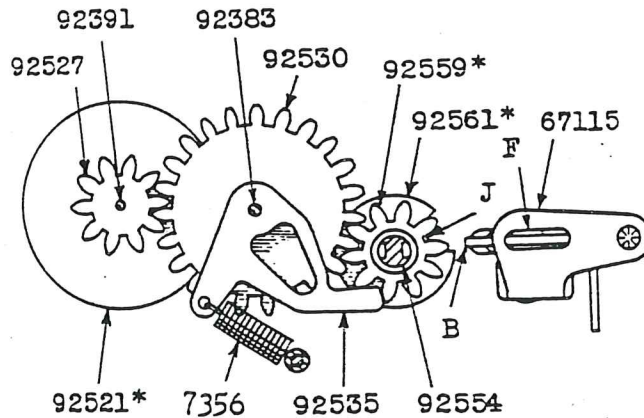


FIG. 1106

5. Gear 92559 (Fig. 1106) rotates Counter Dial Idler 92530, and subsequently Counter Dial Drive Gear 92527\*, one tooth for each cycle. The assembly consisting of ten tooth Gear 92527\* and Counter Dial 92521\* is therefore rotated one tenth of a revolution and will register a count of one more or one less for each cycle of main clutch operation.

6. Counter Dial Centralizing Lever 92535 (Fig. 1106) is held in contact with Gear 92559\* by Spring 7333. The rotation of 92559\* forces Spring 7356 to yield until 92535 drops into the next tooth space, thus assuring the proper alignment of 92559\* to be actuated by finger B and the proper alignment of the dial figures with the Carriage Cover openings.

## CONTINUOUSLY READABLE COUNTER (Cont'd)

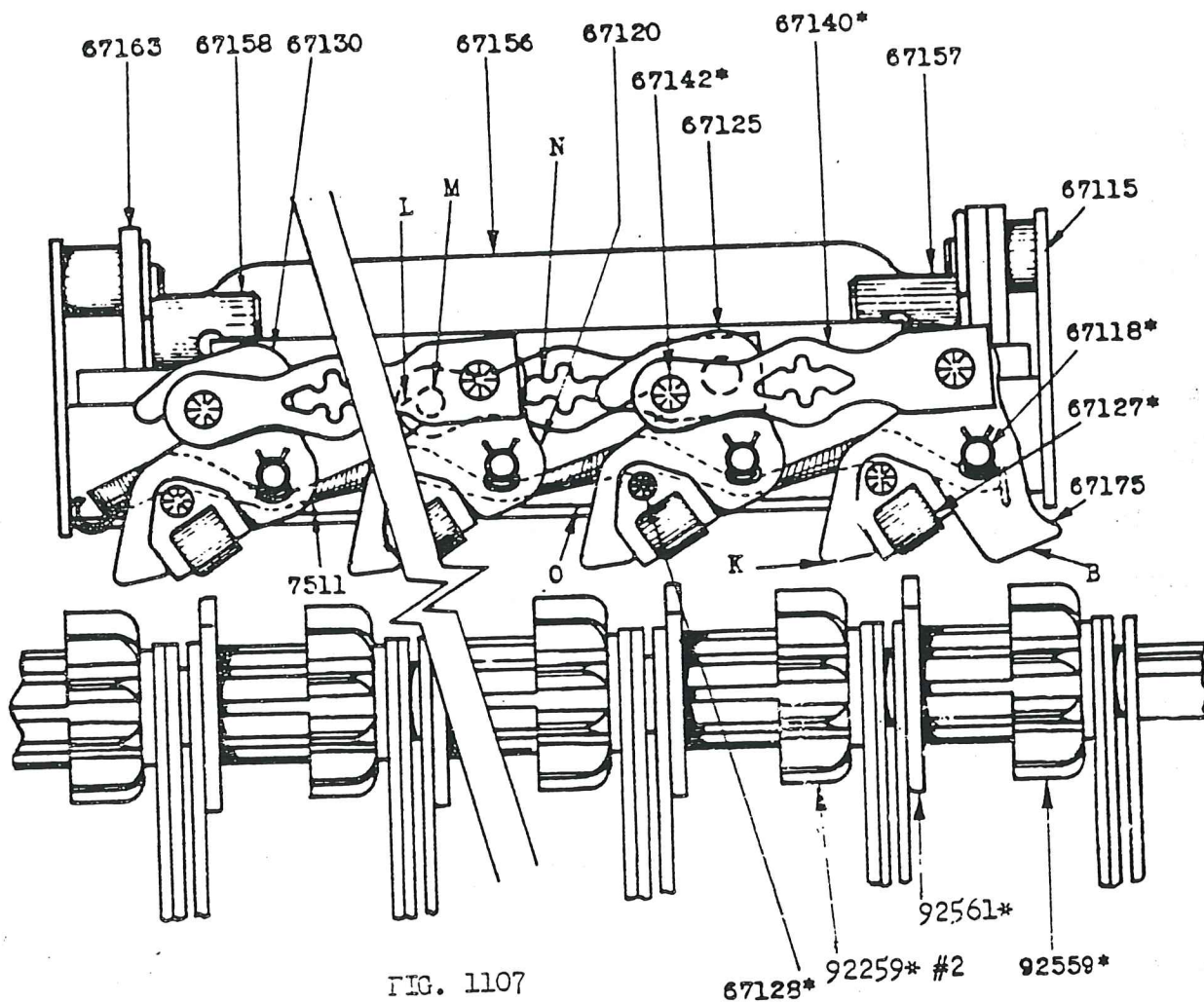


FIG. 1107

7. Counter Transfer Control Disc  
92561 is integral with Ten Tooth  
Gear 92559, therefore notch J in  
92561\* (Fig. 1106) is rotated one  
tenth of a revolution for each  
machine cycle. Roller 67127\* and  
tip K on Lever 67175 (Fig. 1107)  
move forward simultaneously with  
finger B and do one of two things;  
if Disc 92561\* is positioned so

that notch J is in the path of  
67127\* then tip K engages Gear  
92559\* #2 and rotates this gear  
one tooth; if however, notch J is  
in any of its other nine positions  
then Roller 67127\* contacts the  
disc and rocks Lever 67175 in a  
clockwise direction about Stud  
67118\*, thus causing tip K to  
clear Gear 92559\* #2.



## CONTINUOUSLY READABLE COUNTER (Cont'd)

8. A Counter Transfer link 67140\* (Fig. 1107) is riveted to each transfer lever, with Stud 67142\* on 67140\* in contact with surface M of slot L in the next transfer lever to the left, therefore the clockwise rotation of one transfer lever, as described above causes all transfer levers to the left of that order to be rocked into an inoperative position.

9. Counter Transfer Link 67140\* (Fig. 1107) may be shortened by inserting a screwdriver in slot N and twisting, or it may be lengthened by applying pressure with a pair of pliers on the outer edges across the slot. Each link should be adjusted in this manner to assure that when its controll-

ing lever is in its most counter-clockwise position, Stud 67128\* is touching surface O on Carrier 67115 and that surface M in slot L is contacting Stud 67142\*. Stud 67142\* must be free in slot in 67120. When a Transfer Lever-67120, is rotated clockwise the Levers to the right should not move.

10. Eccentric Shaft Right 67157 is connected with Eccentric Shaft Left 67158 by Link 67156 (Fig. 1107) to provide actuation at the left end of Carrier 67115.

11. Support Rod 92381 is rocked in a clockwise direction by Counter Clear Link 57150A (paragraph 7, page 423); Counter Clear Drive

## CONTINUOUSLY READABLE COUNTER (Cont'd)

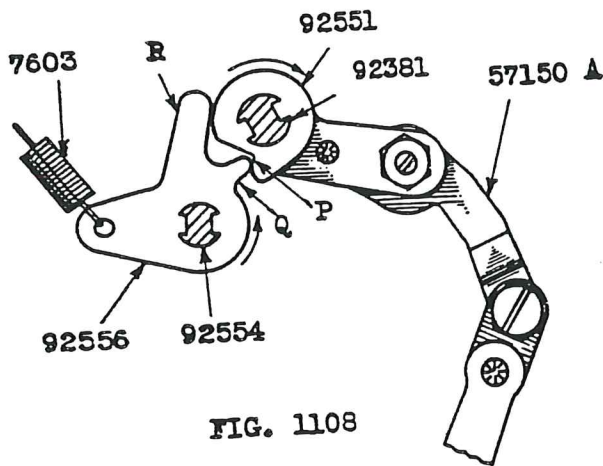


FIG. 1108

Lever Upper 92551 (Fig. 1108) keyed to 92381, is therefore rocked in a clockwise direction causing surface P to contact lug Q on Counter Clear Drive Lever Lower 92556 and rock this lever in a counter-clockwise direction. Lug R limits the clockwise rotation of Lever 92556 to assure that lug Q will always be in a position to be engaged by surface P.

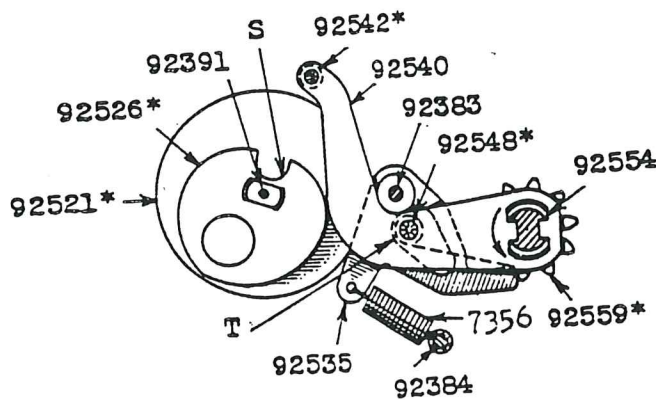


FIG. 1109

12. The counter-clockwise rotation of Clear Shaft 92554 (Fig. 1109) rocks Lever 92540 in the counter-clockwise thus lowering Roller 92542\* into contact with Counter Dial Clear Cam 92526\* Counter Dial 92521\* and Cam 92526\* are assembled together in such a relation that when the "0" on 92521\* is lined up with the carriage dial opening notch S. is located in the path of Roller 92542\*; with the dial in any other position Roller 92542\* contacts the camming surface of 92526\* and rotates the assembly to the "0" position. Roller 92542\* rotates Cam 92526\* in a clockwise direction to clear a dial reading of 1 to 5 inclusive and in a counter-clockwise direction to clear a reading of 6 to 9. Stud 92548\* on 92540, contacts surface T on Lever 92535 and rotates this lever out of engagement with Gear 92559\*; thus permitting the free actuation of the dial assembly by Clear Lever 92540.

## CONTINUOUSLY READABLE COUNTER (Cont'd)

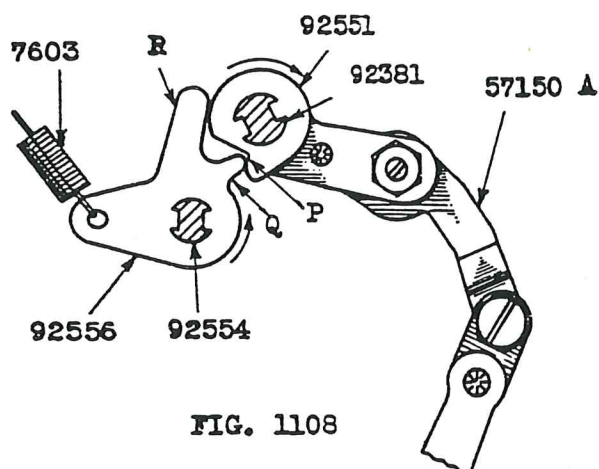


FIG. 1108

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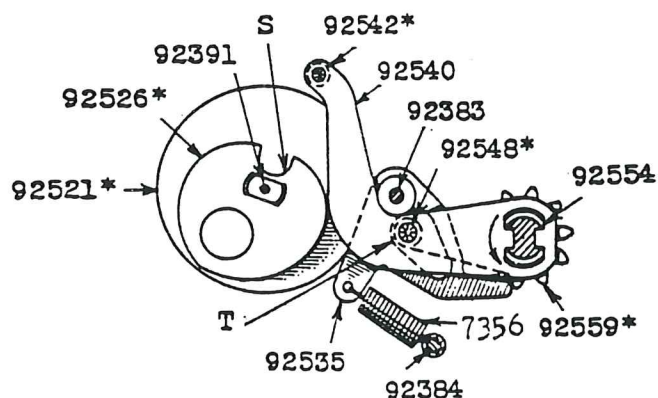


FIG. 1109

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## UNIVERSAL TABULATOR

### PREFACE

1. The main operational features of the Universal Tabulator are described here, prior to the detailed explanation of the several mechanisms necessary for this model.

2. In the FA model the direction of automatic shifts is not optionally controllable. A shift after a multiplication is always to the left and a tabulator shift always to the right except a shift initiated by the No. 1 Columnar Tab. Key, which moves the carriage to the extreme left position. A tabulator shift may be initiated by the Master Tab. Key, the No. 1 or the No. 10 (No. 8 in 8 Bank models) Columnar Tab. Key. One or more intermediate Columnar Tab. Keys can be depressed and latched simultaneously. The carriage will terminate the tabulator shift whenever it reaches an

order in which a Columnar Tab Key has been latched down, and if the Tab. shift is restarted it will again terminate when it reaches the next latched key, or if no other key is latched the carriage will shift to the extreme end position.

3. The function of the extreme end Columnar Keys is to return the carriage to the respective end position, to the extreme left if the No. 1 Key has been depressed, and to the extreme right if the No. 10 (or No. 8) Key has been depressed, regardless of any latched Columnar Keys. An auxiliary function of the extreme left Columnar Key No. 10 (or No. 8) is to release any number of latched intermediate Columnar Keys. This operation is obtained at the maximum or "secondary" stroke of the left Columnar Key.

## UNIVERSAL TABULATOR (Cont'd)

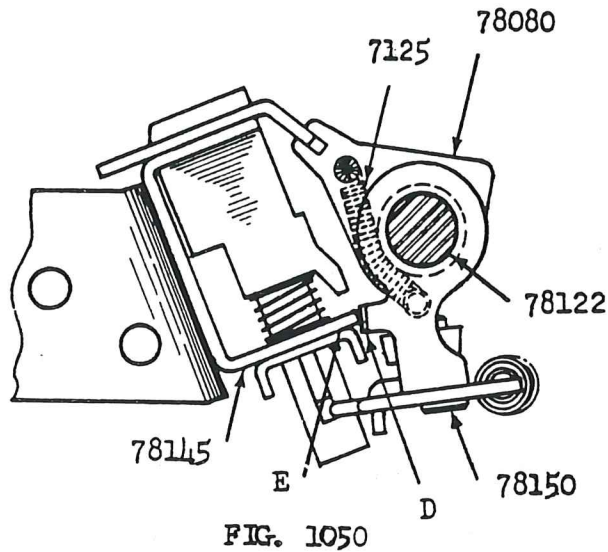


FIG. 1050

1. The termination of any Tabulator Shift, excepting that occurring at either end, is controlled by the latched Columnar Key. The Worm Shaft 78122 is rotated, in either direction, by the lateral movement of the Carriage. (page 891 paragraph 24). The Tabulator Tripper 78150 is moved laterally along Shaft 78122 by the Tabulator Nut 78080 in a direction opposite to that of the Carriage. The Tripper 78150 under the tension of Tension Spring 7125 located on Nut 78080, is normally positioned so that ear "D" is held against the surface "E" of Tabulator Key Sec-

tion 78145 and 78150 will remain in this position, as it moves along Shaft 78122 until it reaches an order in which an intermediate Columnar Key has been latched.

Fig. 1050.

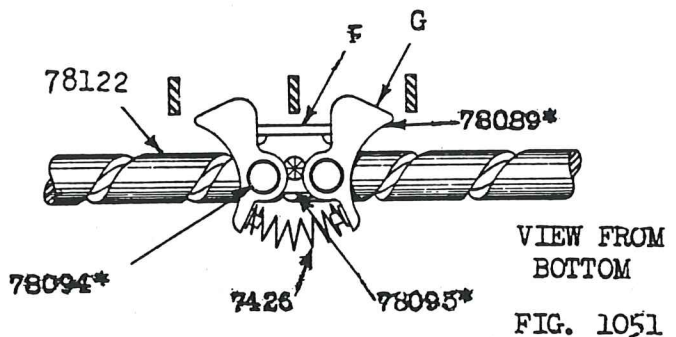


FIG. 1051

2. The Tripper Levers 78089\*, mounted on 78095, and pivoted on Studs 78094\*, are held in their normal position by the Spring 7426 and the ear "F" of 78095\*. The ear "F" also prevents the left Lever 78089\* from turning to the right and the right Lever 78089\* from turning to the left, both about their studs 78094\* Fig. 1051.

3. The latching of any intermediate Columnar Key places the lower rear end of that key directly in the path of the Tripper Lever 78089\* as 78150 moves along the shaft 78122. Fig. 1051.



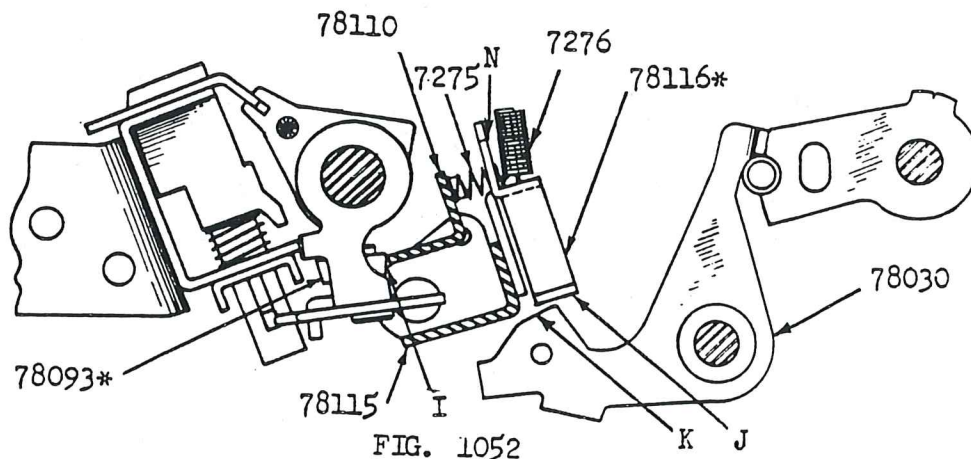
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## UNIVERSAL TABULATOR (Cont'd)

4. As the Carriage shifts to the right the Tripper, 78150, moves along Shaft 78122 to the left. As the Tripper, 78150 encounters a latched key it is rocked rearward about Shaft 78122 by the camming action of surface "G" against the latched key. Fig. 1051.

5. Fastened to Tripper 78150 is the Roller 78093\*, and whenever 78150 is rocked rearward, as explained in paragraph 4, the Roller 78093\*, also moves in a path toward the rear of the machine. Normally positioned by compression Spring 7275 so that surface "I" is

directly in the path of Roller 78093\*, is the Tab Terminating Bail Upper 78110. Bail 78110 is pivoted on the lower Terminating Bail 78115, and 78115 is pivoted to the left Side Frame and on the right end to the Tab Unit Plate 77290 and is normally positioned forward, with the ear "N" of 78116\* contacting Unit Plate 77290, by Spring 7276. Fastened rigidly to the right end of Bail 78115 is the Trip Bracket 78116\* whose lower ear "J" always overlies the surface "K" of the Tab Operating Arm Latch 78030. Fig. 1052.



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## UNIVERSAL TABULATOR (Cont'd)

6. The rocking of the Tripper 78150 causes the Roller 78093\* to contact the surface "I" of Bail 78110. Since the force applied is approximately through the pivot centers of 78110, this Bail does not rotate about its own pivots, instead it causes the lower Bail 78115 to move downward about its pivot centers. During a Tabulator Shift the Latch 78030 is engaged with the Operating Arm Adjusting Lever 78025 (Tab mechanism, page 704, paragraph 8; 78030 and 78015 are similar to

77330 and 77456A respectively), and the lower end of 78030 is in an upward position. As Bail 78115 moves downward, the Bracket 78116\* also moves downward and its lower end "J" contacts the surface "K" of Latch 78030 resulting in the upper end of 78030 being withdrawn from engagement with Lever 78015, thus terminating the Tabulator Shift in a manner similar to CT mechanism. Fig. 1053.

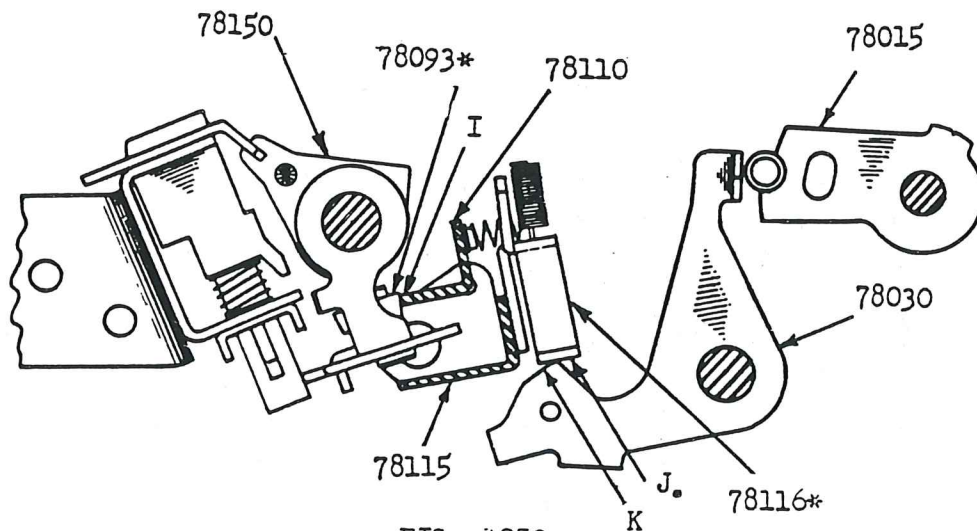


FIG. 1053

## UNIVERSAL TABULATOR (Cont'd)

7. When the No. 1 Columnar Tab Key 78144 is depressed, the extension "L" contacts the ear "M" of the Tab Direction Control Lever Right 78175, normally spring urged by 7276 clockwise, and rocks that lever anti-clockwise about the Stud 78067. The formed extension "O" is moved rearward until the surface "P" contacts the projection "Q" of 78125\* on the upper Bail 78110 and rocks that bail about its Pivots 78119\* and lifts the surface "I" to clear the face of the Roller 78093\*. Fig. 1054.

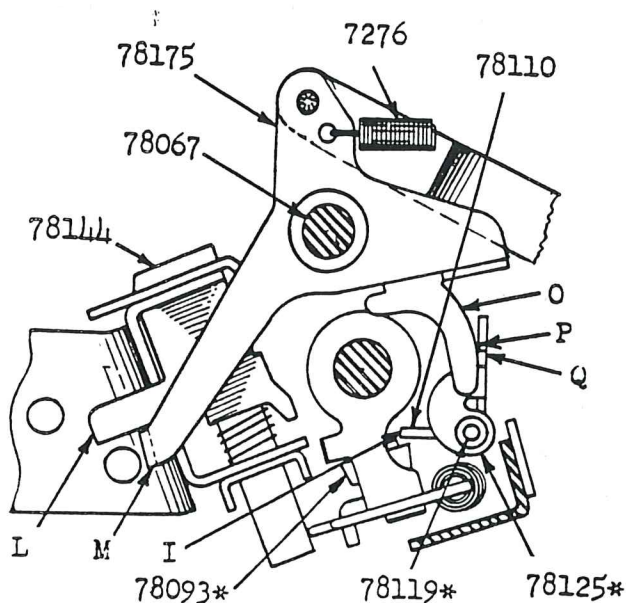


FIG. 1054

8. The Latch 78062, slideable mounted on Shaft 78122, is spring urged to the left by Spring 7558 and is normally restrained by the extension "O" of Lever 78175. Fig. 1055.

9. When the extension "O" is moved rearward, as explained in paragraph 7, it allows the Latch 78062 to move to the left until the maximum rock of the Lever 78175 has been reached, at which point the tapered surface of Latch 78062 rests against Lever 78175 and prevents that lever from returning to its normal position. Since 78175 is restrained, surface "I" of Bail 78110 is raised clear of Roller 78093\* and will remain so until Lever 78175 is allowed to return to its normal position. Fig. 1054 and Fig. 1055.

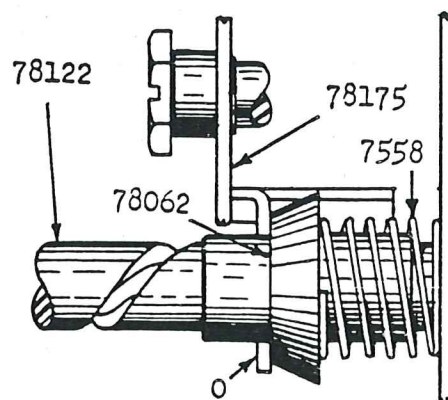


FIG. 1055



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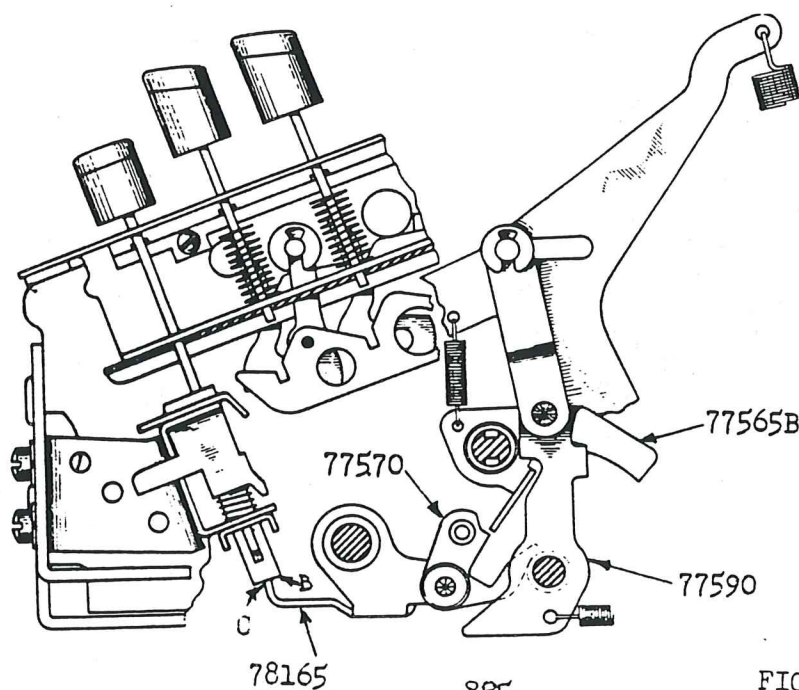
## UNIVERSAL TABULATOR (Cont'd)

10. As the No. 1 Columnar Key is depressed the lower end "B" will contact surface "C" of the Tab. operating Bail 78165 and rock that bail anti-clockwise until the Live Point 77570\* contacts the ear on Latch 77565B to release the Toggle 77590 and actuate the shift as described under "Auto-Clear and Return Mechanism" (paragraph 12 page 811.) Fig. 1056.

The Carriage will always shift to the left when the Tab. Shift is actuated by the depression of the No. 1 Columnar Key (paragraph 7, page 884)

the Tripper 78150 will travel along the shaft 78122 to the right. If one or more intermediate Columnar Keys to the right of the tripper 78150 have been latched, 78150 will be rocked as explained in paragraph 6, page 846.

However, since the upper Bail 78110 is held clear of the roller 78093\* (paragraph 9, page 884), there is no actuation of the lower Bail 78115, and the Latch 78030 remains engaged with Lever 78015. The Carriage will continue to shift to its extreme left position where the shift is terminated when the Latch 78030 is forced out of engagement with 78015 by the Shift Terminating Mechanism (paragraph 26, page 893).



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## UNIVERSAL TABULATOR (Cont'd)

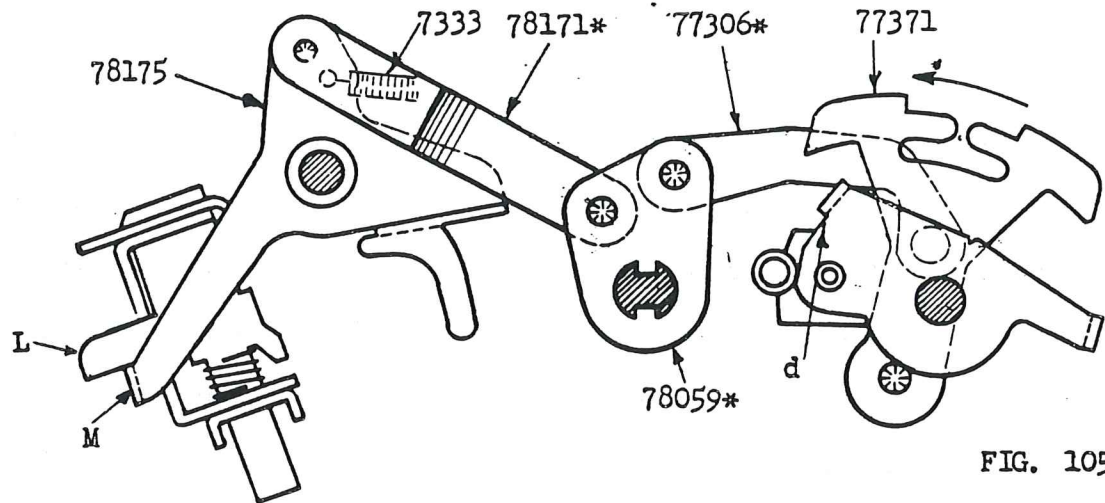


FIG. 1058

11. As the Tripper 78150 moves into the first position, the extreme right order, the right side "R" contacts the Latch 78062, forcing it to the right and allowing the Lever 78175 to return to its normal position. The extension "O" of 78175 moving forward also allows the upper Bail 78110 to return to its normal position and the surface "I" is again in the path of the Roller 78093\* (See Fig. 1055). The Latch 78062 is restrained when the Lever 78175 reaches its normal position, as the extension "O" blocks the left side of 78062. Fig. 1057.

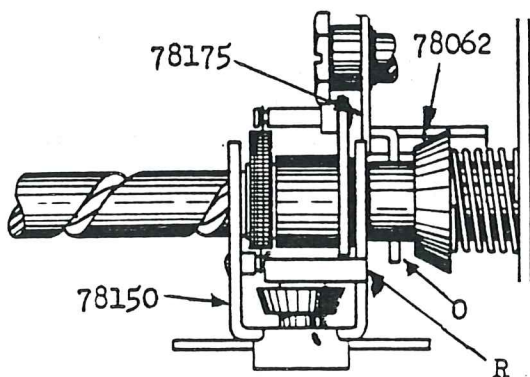


FIG. 1057

12. As the No. 1 Columnar Tab. Key is depressed extension "L" contacts ear "M" on Tab. Direction Control Lever Right 78175 rotating it anti-clockwise against the tension of Spring 7333. As Lever 78175 is rocked anti-clockwise it pulls Link 78171\* forward rotating 78059\* anti-clockwise, which consequently pulls Link 77306\* forward rocking Tee 77371\* forward over ear "d" for a left carriage shift. When the No. 1 Columnar Key is released the above-mentioned mechanism is restored to its normal position through tension of Spring 7333. Fig. 1058..

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## UNIVERSAL TABULATOR (Cont'd)

13. The depression of the extreme left No. 10 Columnar Tab Key, 78142 lowers the extension "S" to contact the ear "T" on the Tab Direction Control Lever Left 78070 and rock that lever anti-clockwise. The arm "U" of 78070 is moved rearward, and it contacts the projection "V" of 78135, fastened on the upper Bail 78110, to rock the Bail 78110 about its pivots 78119\* and lift the surface "I" of 78110 to clear the face of the Roller 78093\*. Fig. 1059.

14. Mounted on the Left Side Frame is the Left Control Lever Latch 78075.

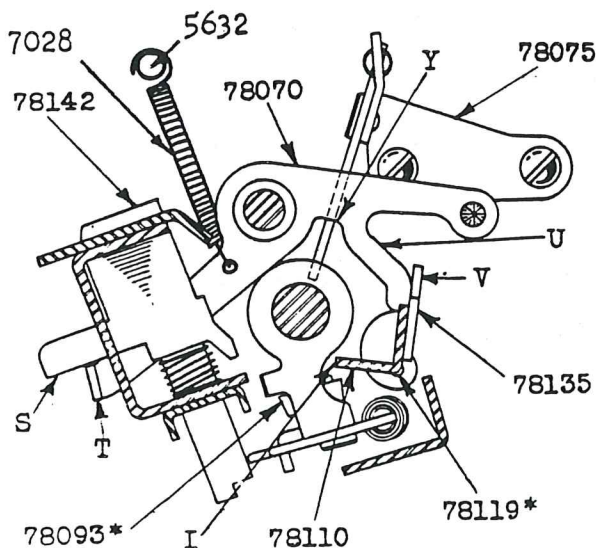


FIG. 1059

When the Lever 78070 is in its normal position the surface "W" of Latch 78075 is spring urged by 7254 against the left side of 78070. At the position where Lever 78070 has rocked sufficiently so that the surface "I" of Bail 78110 is clear of Roller 78093\*, the shelf "X" of Latch 78075 is rocked about Stud 78073\* by Spring 7254 into a position underlying the notch "Y" of lever 78070 (see Fig. 1059) thus preventing the return of 78070 and holding the surface "I" clear of the Roller 78093\*. Fig. 1060.

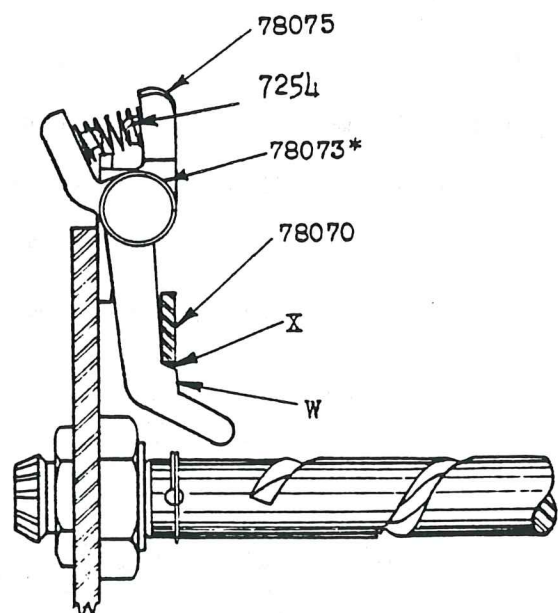


FIG. 1060



## UNIVERSAL TABULATOR (Cont'd)

15. Directly underlying the No. 10 Columnar Tab Key is the Spring Bracket 78160. After the Lever 78070 has been rocked to its latching position, as explained in the preceding paragraph, a further depression of the No. 10 Key will result in the lower end of that key contacting the Retainer 78156\*. As the resistance of the Spring 7598 is greater than that of the Operating Bail 78165 and the Toggle tripping mechanism, the No. 10 Key will rock the Bail 78165 and trip the Toggle to actuate the Tabulator Shift.

Fig. 1061.

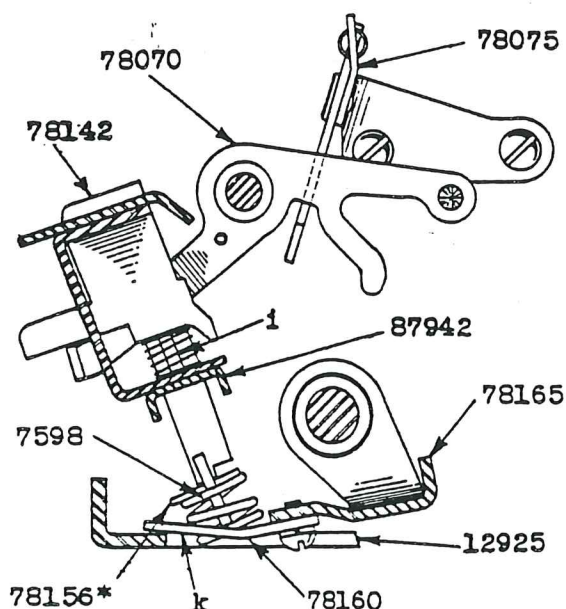


FIG. 1061

16. The carriage will always shift to the right when the Tab Shift is actuated by the depression of the No. 10 Columnar Tab Key and the Tripper 78150 will travel along Shaft 78122 to the left. If one or more intermediate Columnar Tab Keys to the left of 78150 have been latched, 78150 will be rocked as explained in paragraph 4, page 846 (the rocking action is the same, whether Tripper 78150 is traveling to the right or to the left.) However, since the upper Bail 78110 is held clear of Roller 78093\* there will be no actuation of the lower Bail 78115, and the Latch 78030 will remain engaged with Lever 78015. The Carriage will shift to its extreme right position, and the shift will be terminated when Latch 78030 is forced out of engagement with 78015 by the Shift Terminating Mechanism. See paragraph 26, page 893.

## UNIVERSAL TABULATOR (Cont'd)

17. As the Tripper 78150 moves into the tenth position, the extreme left order, the left side of 78150 contacts the nose "Z" of Latch 78075 rocking it to the left about the Stud 78073\*, and the shelf "X" is rocked from under Lever 78070 and allows that lever to return, under spring pressure to its normal position, Fig. 1062. The arm "U" of 78070 moving forward also allows the upper Bail 78110 to return to its normal position, and the surface "I" is again in the path of the Roller 78093\*.

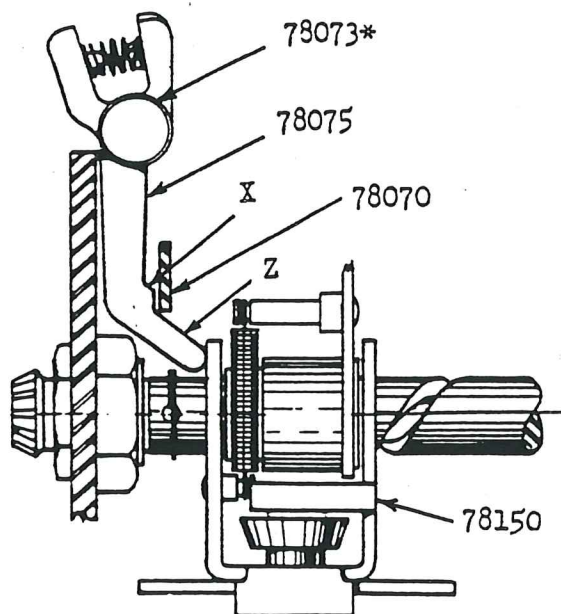


FIG. 1062

18. Any, or all, of the intermediate Columnar Tab Keys may be released by the depression of the extreme left Columnar Tab Key 78142. After the Tab Operating Bail 78165 has been rocked sufficiently by the Columnar Key 78142 to trip the Toggle, the Bail 78165 is positively stopped by the arm "k" of 78160 contacting the Bottom Frame 12925, and under normal pressure the stroke of Key 78142 is also terminated. At this position of Key 78142 the extrusion "i" is above the Lock Bar 87942. Fig. 1061.

19. However, applying heavier pressure to Key 78142 causes the Spring 7598 to yield, and 78142 moves downward until the extrusion "i" forces the Lock Bar 87942 to the right releasing all latched intermediate Columnar Keys. The extrusion is so shaped that Key 78142 can not be latched.

# MARCHANT

## UNIVERSAL TABULATOR (Cont'd)

20. In the FA models the direction of automatic shifts are not optionally controllable but are always to the left and Tabulator shifts always move to the right, except a shift initiated by the No. 1 Tab. Key, which moves the carriage to the left.

21. 72555B\* is held by spring 7008 so that it always overlies the ear on 72382A\*. 1063

Therefore, when 72555B\* is moved forward by the carriage rise (see "Shift" page 613, paragraph 2) it will pull Link 72382A\* forward to actuate a left automatic shift.

22. When the Non-Shift Key 72956\* is depressed it is held down by spring 7008 through latch 72776. Otherwise the operation is the same as in Silent Speed "M" machines. (See page 614, paragraph 6.)

Fig. 1063

23. The Non-Shift Key may be released from its latched position by the "Stop" Key. Form "D" of "Stop" Key 36202 overlies surface "E" of Latch 72776 when the "Stop" Key is depressed form "D" contacts surface "E" and causes Latch 72776 to rotate clockwise releasing the Non-Shift Key, 72956\*, which returns to its normal position under pressure of spring 7008. Fig.

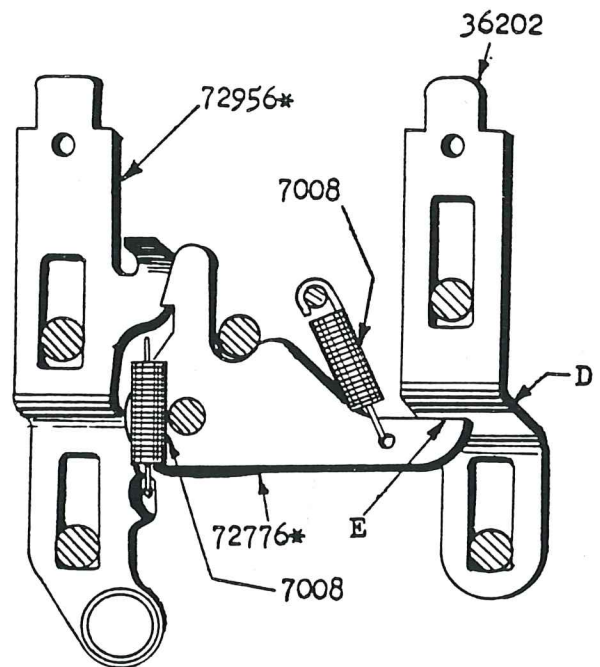


FIG. 1063



## UNIVERSAL TABULATOR (Cont'd)

24. The Tab Starting Lever 77545, after being lowered by the release of the Toggle 77590A, is recocked during the first cycle of the Tabulator Shift by the Tab Recocking Cam 78204 pinned to the Shift Jack Shaft 72342. Pivoted on shaft 78216 is the Recocking Bail 78210 and the Roller 77437\*, mounted on 78210, which rests against the back face of the Cam 78204. As Cam 78204 starts to rotate it rocks the Bail 78210 rearward so that the Link 78203\*, connected to the lower end of 78210, is also moved rearward and the forward end of 78203\* fastened to the Adjustment Plate 78206\*, of the Lever

Assembly 78205, rocks 78205 in a clockwise direction about the Pivot 78214. Also a part of the Assembly 78205 is the Recocking Lever 78207\* whose forward arm "m" is raised as 78205 is rocked clockwise and as it underlies the Stud 77358\*, the Tab Starting Lever 77545 is lifted about Stud 78067 until the Toggle is latched as explained under "Auto Clear and Return Mechanism," paragraph 14, page 812. The Recocking Lever 78207\* is fastened to the Adjustment Plate 78206\* by means of the Eccentric Nut 36723 and the Screw 5477. The proper overstroke for the latching of the Tab Toggle is from .010" to .020" and may be obtained by means of the Eccentric Nut 36723. Fig. 1064.

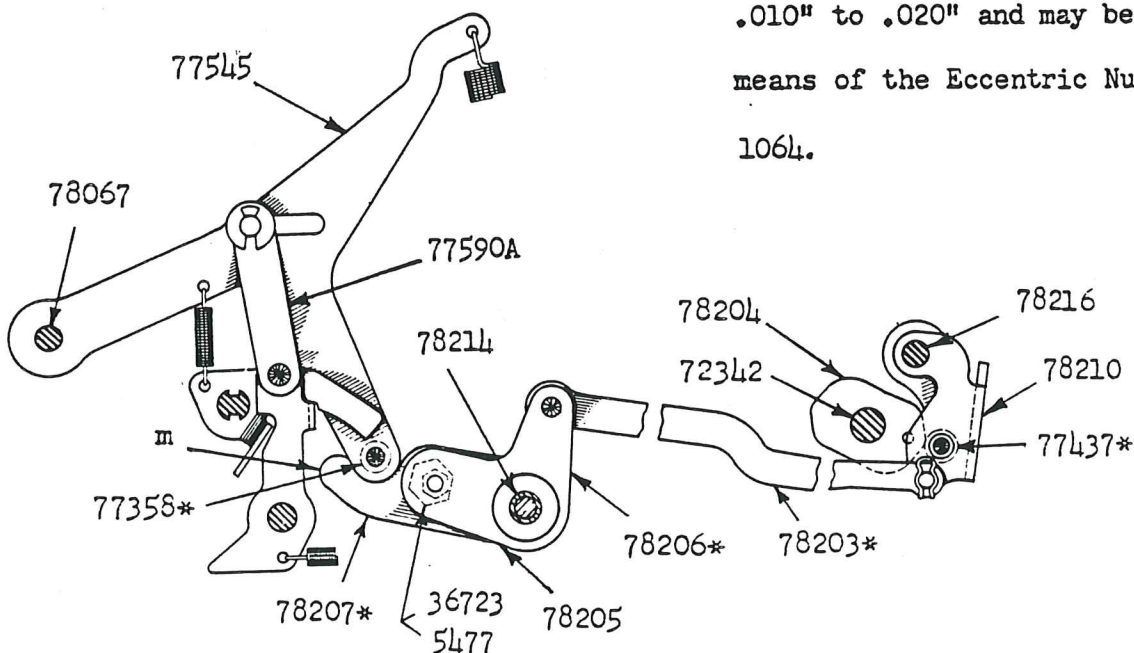


FIG. 1064

# MARCHANT

## UNIVERSAL TABULATOR (Cont'd)

25. The Tripper 78150 is moved laterally in either direction along the Worm Shaft 78122 by the rotation of that shaft and the direction of lateral movement of 78150 is always opposite to that of the Carriage. Positive rotation of the Worm Shaft 78122 by the lateral movement of the Carriage is obtained by means of a drive shaft and a system of gearing. Rack 92915 is rigidly fastened to the Carriage at the left end and meshed with the Drive Pinion 77023 which is pinned to the upper end of Drive Shaft 77037. The upper end of Shaft 77037 is supported

by the Bearing 77027\* on the Bracket 77025, and the lower end is supported by the Bearing 78102\* on Bracket 78100. Pinned to the lower end of Shaft 77037 is the Bevel Gear 77044 which meshes with the Bevel Pinion 77252 pinned to the Worm Shaft 78122. The amount of backlash between Gear 77044 and Pinion 77252 should be kept as small as possible, just enough to eliminate any bind. Adjustment for backlash may be made by moving the lower Bracket 78100 in the slots provided. Also, any binding action between Rack 92915 and the Pinion 77023 can be eliminated by adjusting the upper Bracket 77025. Fig. 1065

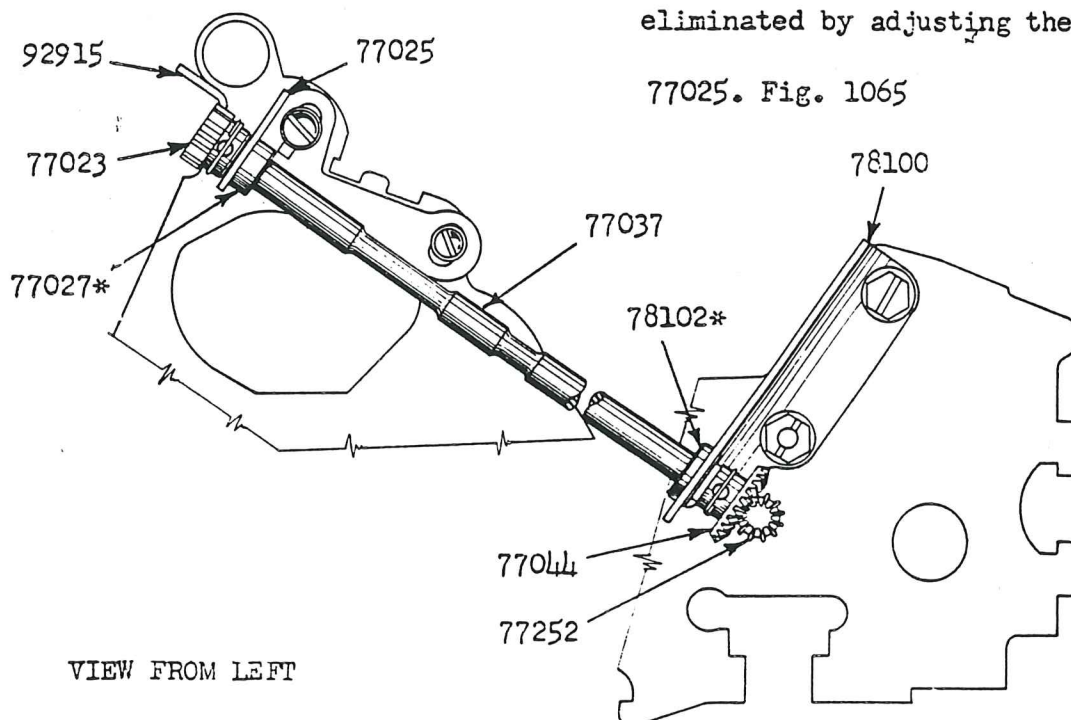


FIG. 1065

# MARCHANT

## UNIVERSAL TABULATOR (Cont'd)

26. Located at each end of the Shift Rack 92097D is the ear "o", and as the Carriage shifts into either extreme end position, the Rollers 72253B\* on 72240B\* contact the ear "o". As the Vertical Shift Shaft Assembly 72245C is rotating, the Rack 92097D is raised about Shaft 92384. Pivoted on Shaft 67186 is the Shift Terminating Trip Lever 72906 whose forward surface "p" overlies one of the ears "o" as the Carriage moves into either end position and has the ear "q" on its lower extension in the slot of the Shift Terminating Bell Crank 72410A. When the Rack 92097D is raised, the forward end of Lever 72906 moves upward and the ear "q" moves forward causing the Bell Crank 72410A to rock anti-clockwise about Shaft 27191A. The forward end of 72410A moves

downward, and as its ear "r" overlies the Stud 72426\* on Shift Connecting Link 72024C that Link is also lowered. The Stud 72023A\* on Link 72024C as it moves downward, contacts the shelf "s" on the Interponent 77395 and rocks it about Pivot Stud 77398 causing the nose "t" of 77395 to raise and force the Latch 78030 out of engagement with 78015, thus terminating a Tabulator Shift Fig. 1066.

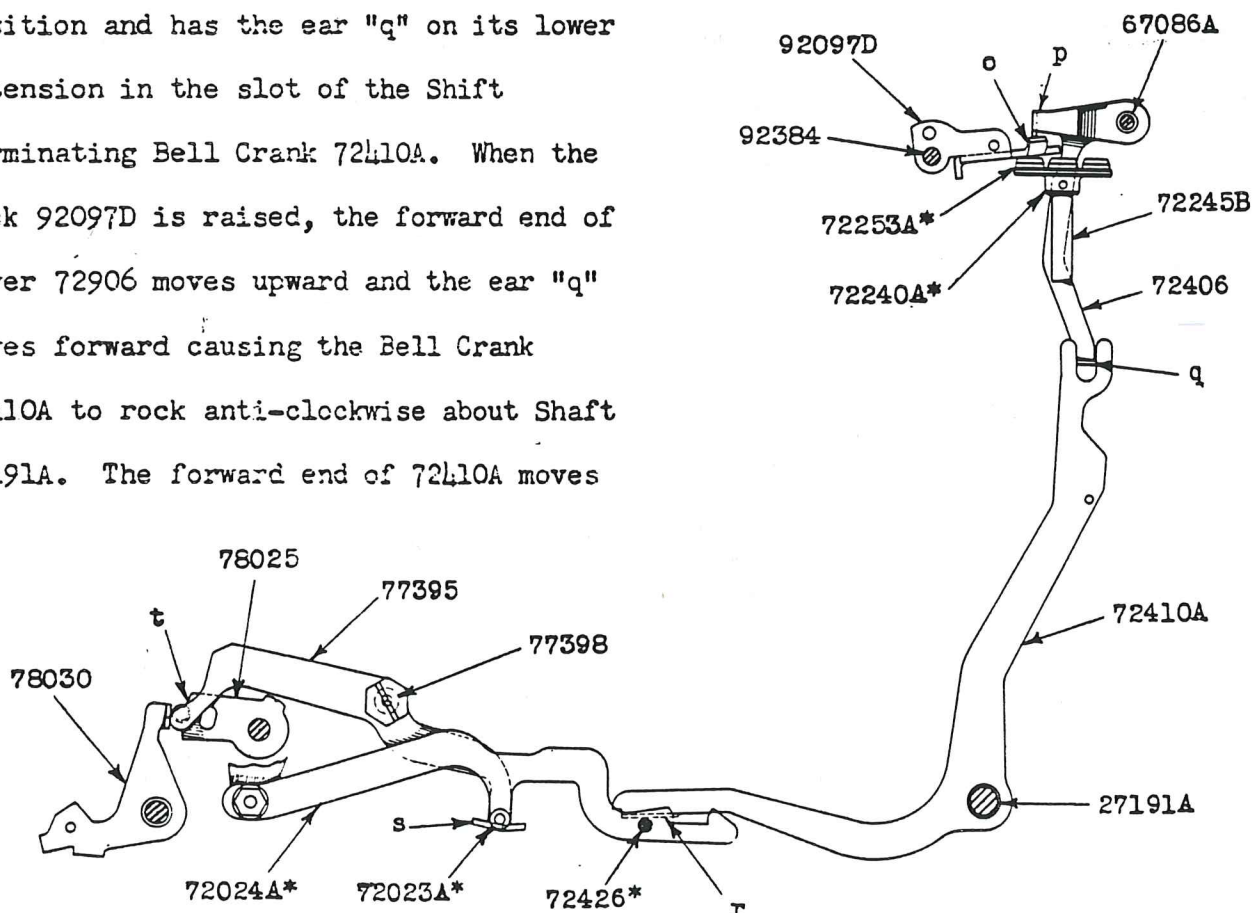


FIG. 1066



## UNIVERSAL TABULATOR (Cont'd)

27. Whenever the Carriage dips, the Stud 27968A\* on the Carriage positioning Link 27967 contacts the surface "u" of the Shift Terminating Bell Crank 72410A and rocks that lever clockwise about Shaft 27191A. This causes the forward end of 72410A to move downward, producing identical movements of those levers as explained in paragraph 26 and particularly the raising of the nose "t" of Interponent 77395. Pivoted on Shaft 77384A is the Tab Disabling Lever 77385, and in its normal position the lower end "v" underlies the Stud 77572\* on Live Point 77570\*, and the Roller 78052\* on 77390 rests against the surface "w" of 77395. As the nose "t" of 77395 is raised, the

surface "w" rocks the Lever 77385 about Stud 77384A so that its lower end "v" is moved forward to raise the Live Point 77570\* away from the ear "x" on the Latch 77565B and prevents the tripping of the Tab Toggle 77590. Fig. 1076. See "Auto". Division", paragraph 10, page 458 the depression of the Division Key will lower Link 72024C\* and also disable the Live Point 77570\* in the identical manner as explained above.

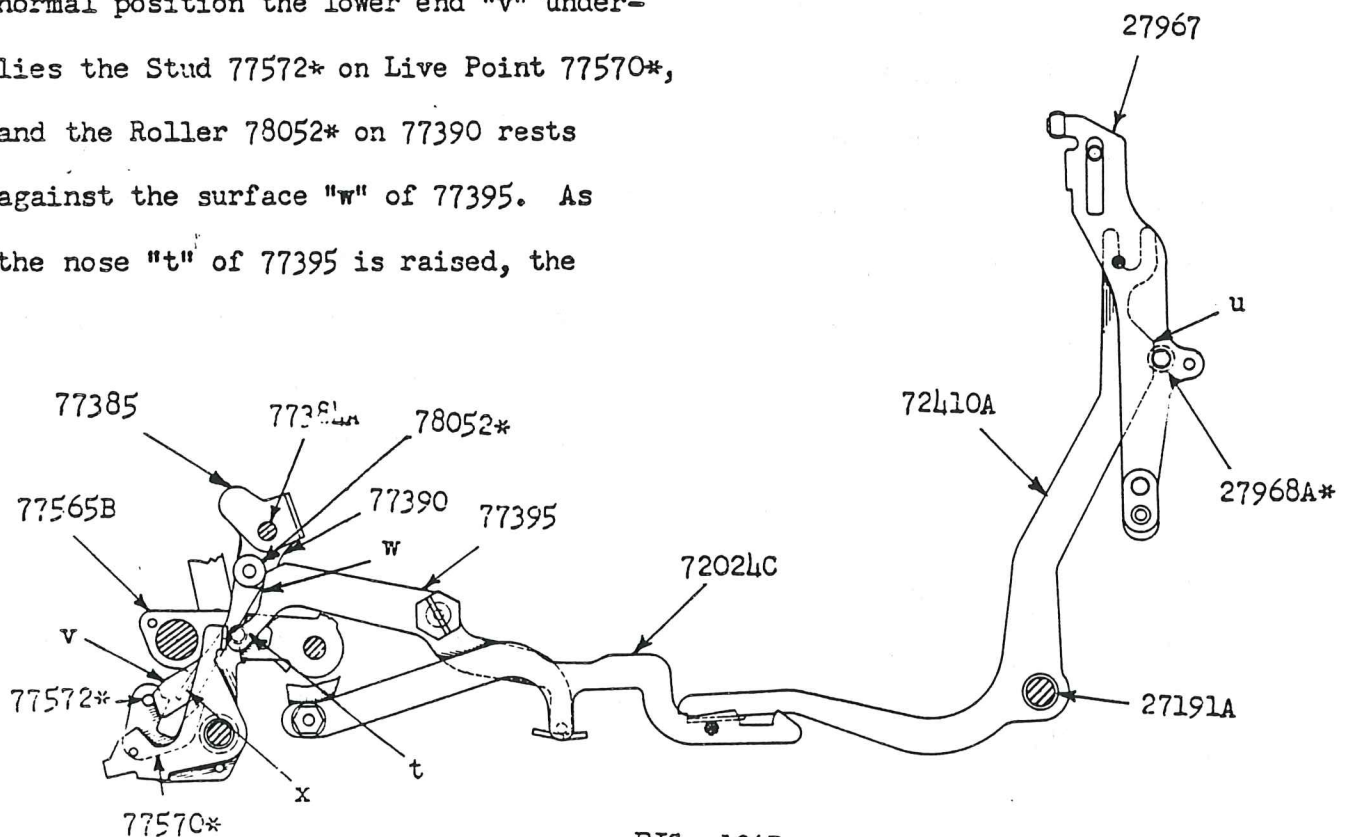
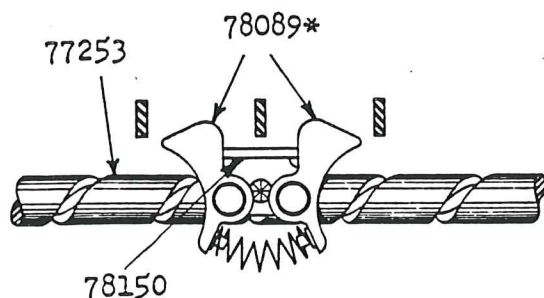


FIG. 1067

# MARCHANT

## UNIVERSAL TABULATOR (Cont'd)

28. It is necessary to have the Tabulator Tripper 78150 in time with the carriage. When the carriage is moved to either extreme end position, the Tripper should also be at its corresponding end position on the Worm Shaft 78122. This will give a rough adjustment. To make a final adjustment set the carriage at some intermediate position. The Lower Tabulator Key Stem corresponding to that order should come midway between the two Tripper Levers 78089\*. This may be adjusted by loosening the lower Drive Shaft Bracket 78100 so that the teeth of Bevel Gear 77014 and Bevel Pinion 77252 may be slipped. The Worm Shaft 78122 may then be rotated until the Tripper is in its proper position. Fig. 1068 and 1065.



VIEW FROM BOTTOM

FIG. 1068

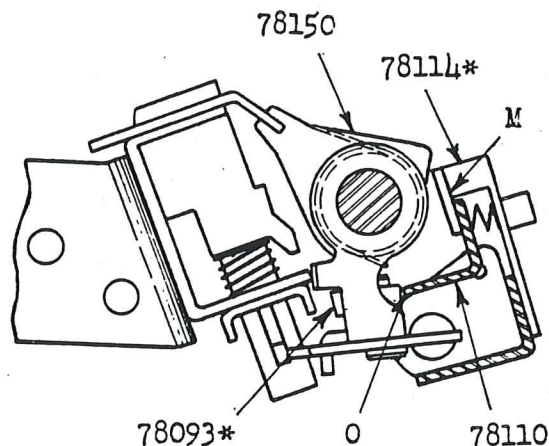


FIG. 1069

29. The angle at which the Upper Terminating Bail 78110 sets in relation to the Roller 78093\* on Tripper 78150 may be adjusted, if required, by bending ear "M" of Tab. Bail Stop 78114\*. The edge "O" of the Bail should come close to the top of the Roller. Fig. 1069. If the edge is positioned too low the Upper Bail may not be rocked sufficiently, by the depression of either one of the extreme end columnar keys, to be clear of the Roller when it is raised by 78150 hitting a latched intermediate Columnar Key.

# MARCHANT

## UNIVERSAL TABULATOR (Cont'd)

30. The distance between Roller 78093\* and the edge "O" of Bail 78110 should be kept as small as possible, just enough clearance to allow Bail 78110 to be rocked free of Roller 78093\*. Adjustment to obtain this required clearance is made by bending ear "P" of Tab Terminating Bail Trip Bracket 78116\*. Fig. 1070.

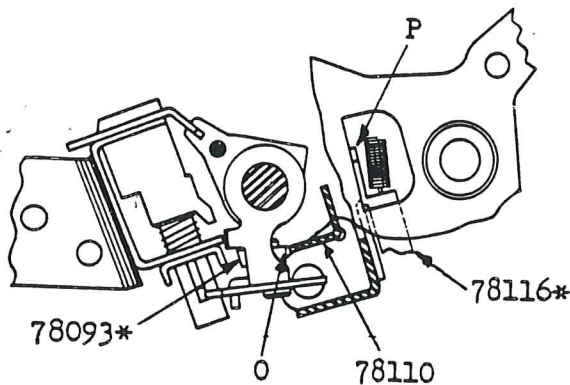


FIG. 1071

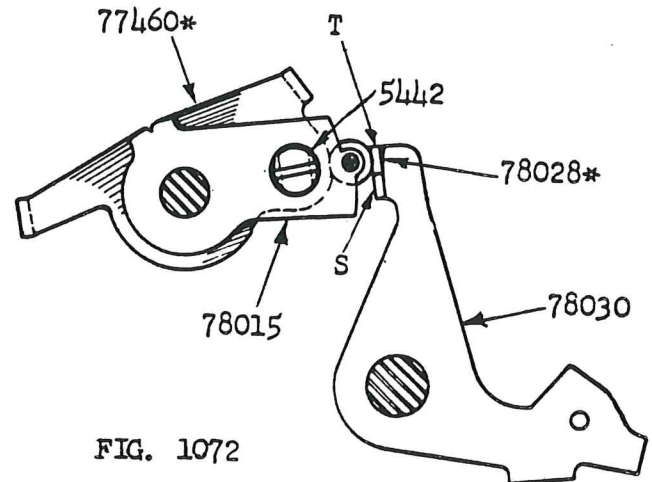


FIG. 1072

31. To insure proper latching of 78030 with 78015, the Roller 78028\* of Tab. Operating Arm Adjusting Lever 78015 should set halfway between surface "S" and "T" of latch 78030 when in the unlatched position. This may be accomplished by loosening screw 5442 and adjusting 78015 in relation to 77460\* of Assembly 72945. Fig. 1071.